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ABSTRACT

In 2 years of activity the Study of Curriculums for Occupational Preparation and Education (SCOPE) has moved in the direction of systematic, interdisciplinary, self-improving curriculum development. A major product of this phase of the study is a three-dimensional (domain-process-object) taxonomy covering the perceptual, ccgnitive, affective, and psychomotor domains. Also, conferences sponsored by SCOPE for 15 curriculum development laboratory directors resulted in the organization of the Vocational Instructional Materials group for the purposes of promoting interest in instructicnal materials. A third area of concern has been experimental studies of homogeneous versus heterogeneous ability grouping in secondary schools. In examining 18 such studies, SCOPE found that little support existed for either. SCOPE also attempted to design a curriculum development model that included task analysis, behavioral objectives, insructional activities, and evaluative procedures. SCOPE is based on a philosophy of a student-centered curriculum which emphasizes individualized, hands-on education. A related document is available as ED 027 438. (JS)

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FINAL REPORT

Project No. 8-0334
Grant No. OEG-0-8-080334-3736 (085)

SCOPE PROGRAM

• • • DESIGNING A **S**TUDENT-CENTERED
CUSTOMIZED
OCCUPATIONALLY-RELEVANT
PARTICIPATORY
EDUCATION • • • FOR THE FUTURE

September, 1970

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

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A Research Activity of

GRADUATE SCHOOL OF EDUCATION

RUTGERS UNIVERSITY

New Brunswick, New Jersey

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FINAL REPORT

Project No. 8-0334
Grant No. OEG-0-8-080334-3736 (085)

A STUDY OF CURRICULUMS FOR OCCUPATIONAL PREPARATION AND EDUCATION (Scope Program: Phase I)

Bruce W. Tuckman

Rutgers University
New Brunswick, New Jersey

September, 1970

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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During the course of this project we had the opportunity to work with the ES '70 network of schools and to attend some of their meetings. We were especially helped in our activities by Mr. Thomas Dietz of Willingboro, N. J. with whom we created the Willingboro Project, and Dr. Lawrence Creedon of Quincy. Throughout the project, Dr. Robert Pruitt, first of Quincy and then of the U. S. Office of Education, was helpful and supportive. We

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TABLE OF CONTENTS

Summary		1
Prologue		4
Part I	The Development and Testing of a Taxonomy for Classifying Educationally-Relevant Behaviors	
	Introduction	9
	Plan of the Study	22
	Methods	22
	Results	32
	Discussion	48
	References	53
	Appendix I-A	55
	Appendix I-B	58
Part II	Forging an Effective Communication Link Among State-Supported Curriculum Laboratories in Vocational Education	
	Introduction	60
	Methods	61
	Results	65
	Conclusions	74
	Appendix II-A	76
	Appendix II-B	82
Part III	A Study of Ability-Grouping	
	Introduction	84
	Review of Literature	85
	Methods	108
	Results	110
	Conclusions	117
	References	121
	Appendix III-A	123
Part IV	A Systems Model (Short-Term) for Achieving Interdisciplinary Education (The Willingboro Project in Communication Arts and Technologies)	

	Introduction	126
	A Plan for ES '70	127
	The Willingboro Project	131
	A Systems Model for Instructional Design and Management	132
	SCOPE's Planned Contribution (Methods)	152
	Results	156
	References	158
Part V	The Student-Centered Curriculum: A Concept in Curriculum Innovation	
	Postulates	159
	Propositions	163
Epilogue		170
Eric Report Resume		

TABLE OF TABLES

Table	Title	Page
I-1	Activities for Evaluating Process-Object Model	24
I-2	Aptitude (Function) Test Battery Factor Analysis (Factor Loadings)	33
I-3	Summary of Aptitude (Function) Test Battery Factors	35
I-4	Secretarial Competence Test Battery Factor Analysis (Factor Loadings)	38
I-5	Technician Competence Test Battery Factor Analysis (Factor Loadings)	39
I-6	Secretary Supervisor Ratings Factor Analysis (Factor Loadings)	41
I-7	Correlations Between Demographic and Aptitude Measures and the Secretarial Competence Battery (N = 38)	43
I-8	Correlations Between Demographic and Aptitude Measures and the Secretary Supervisor Ratings (N = 38)	44
I-9	Correlations Between Secretary Supervisor Ratings and the Secretarial Competence Battery (N = 38)	46
I-10	Correlations Between Demographic and Aptitude Measures and the Technician Competence Battery (N = 36)	47
II-1	A Summary of State Curriculum Laboratories	66
II-2	Influences on Curriculum in Vocational Education	70

Table	Title	Page
III-1	A Summary of the Grouping Studies	86
III-2	Chi-Square Test of Independence Between Curriculum and Grouping Level in English	111
III-3	Chi-Square Test of Independence Between Curriculum and Grouping Level in Social Studies	112
III-4	Correlation Matrix	114
III-5	Correlations Between Standardized Tests and Grouping Levels	115
III-6	Correlations Between Attendance and Standardized Test	116
IV-1	Explanation of PERT Diagram for Willingboro Project	154

TABLE OF FIGURES

Table	Title	Page
I-1	The Domain-Process-Object Model for Classifying Behavioral Objectives	11
I-2	PERT Network of Activities for Evaluating Process-Object Model	23
III-1	Absences in English and Social Studies as a Function of Grouping Level	118
III-2	Absences as a Function of Curriculum	119
IV-1	Rudimentary Diagram of the Basic Steps in the Willingboro Project	133
IV-2	Sequential Phasing of the Willingboro Project	134
IV-3	A Systems Model for Instructional Management	136
IV-4	A Model for Developing an Interdisciplinary Curriculum	138
IV-5	Specifying a Sequence for Behavioral Objectives	143
IV-6	Possible Contingency Outcomes and their Implication for Instructional Design	149
IV-7	PERT Diagram of Activities for Willingboro Project	153

SUMMARY

SCOPE activity was divided up into the following: (a) the development and testing of a taxonomy for classifying educationally-relevant behaviors, (b) forging an effective communication link among State-supported curriculum laboratories in vocational education, (c) a study of ability-grouping, (d) developing a systems model (short-term) for achieving interdisciplinary education (the Willingboro Project in communication arts and technologies), and (e) developing the student-centered curriculum: a concept in curriculum innovation. Each activity is covered in a section of the final report.

A three-dimensional, domain-process-object, taxonomy was developed covering the four psychological domains, viz. perceptual, cognitive, affective (emotional), and psychomotor. Processes include acquisition, application, evaluation, and communication; objects include people, data, and things. Within the acquisition process, the following functions (aptitudes) were identified: (perceptual) sensing, attending, resolving, distinguishing, recognizing; (cognitive) memorizing, associating, conceptualizing, processing, creating; (affective) introspecting, orienting, valuing, integrating; (psychomotor) reacting, adjusting, coordinating, habituating.

The taxonomy was seen as a potential vehicle for reorganizing educational objectives in terms of functions and processes that are more relevant to real-life behavior than are subject-matter delineations. To test the taxonomy, three test batteries were assembled. The first was a battery of aptitude tests to measure each of the aptitudes listed above; the second were batteries of competency tests for secretaries and technicians; the third were competency ratings by supervisors. Data were collected from 36 secretarial trainees and 38 technician trainees on each appropriate battery. Each battery was factor analyzed yielding factor structures which bear some but not perfect resemblance to the four domains. All test scores were intercorrelated. Competency tests and competency ratings intercorrelated significantly in most cases, providing validity for the competency tests. Aptitude test scores showed no meaningful pattern of relationships to either competency tests or competency ratings, leading us to conclude that they would be of little value in predicting competency.

While the taxonomy did not pass its first test with flying

colors, it received enough support to recommend that it be tried to classify educational objectives (using 3 criteria set forth in the prologue of the final report).

About one-third of the States sponsor curriculum development laboratories in vocational education. These are located within the State Department of Education or in the State University. Directors (or their representatives) of most of these laboratories participated in two SCOPE conferences aimed at facilitating the development of some continuing communication linkage among these labs and updating lab personnel in curriculum innovations. As regards the communication-linkage task, lab directors formed an organization for interest in Vocational Instructional Materials (VIM) as a result of the SCOPE meetings and were recognized by the American Vocational Association (within the New and Related Services Division). They were awarded program time at the 1969 AVA meetings in Boston.

The updating conference resulted in a SCOPE conference proceedings publication entitled Recent Innovations in Curriculum Design and Instructional Materials.

Our third area of effort was in the study of homogeneous ability grouping in the secondary schools. A total of 18 experimental studies of homogeneous versus heterogeneous grouping were reviewed and summarized. In sum, they provide no great support for either approach. We examined the group assignment of 161 high school seniors in social studies and English as they relate to one another, to curriculum major (i.e., college prep, vocational, etc.), to IQ scores collected from 7th to 10th grade, and to attendance in their senior year. The probability the student would receive the same group assignment in English and social studies was found to significantly exceed chance. Moreover, the distribution across ability group assignments was found to be a function of curriculum major with college prep students being assigned to the higher groups in significantly more instances than vocational, business, and general majors in both subject matters. Grouping assignment in the 12th grade was also found to relate significantly to IQ test scores even on a non-verbal IQ test taken in the 7th grade. Finally, college prep and general students were found to have considerably fewer absences than business and vocational students. One can infer from these findings that grouping tends to create lockstep patterns for students which are likely to effect their school performance.

SCOPE also was involved in the design of a short-term sys-

tems model for curriculum development. This model was to be implemented through a conjoint effort of SCOPE and a local school district (Willingboro, N. J.) as part of a plan for coordinated curriculum development and implementation by a University-public school team. Curriculum development activities were to include: task analysis, restatement of tasks as behavioral objectives, sequencing of behavioral objectives, specifying instructional activities, designing evaluative procedures, conducting instructional tryouts with evaluation, and feedback, revision, and retesting.

Moreover, the planned curriculum was to be interdisciplinary — Communication Arts and Technologies — combining academic studies with studies oriented to the screen arts, television electronics and maintenance, and business and office procedures for the television industry. The plans for this activity appear in the final report. They were never carried out because Willingboro was unable to secure funds to pay teachers for time to be spent in developing curriculum materials.

The final section of our report includes a statement of our philosophy — the student-centered curriculum. This approach emphasizes a Student-centered, Customized (individualized), Occupationally-relevant, Participatory ("hands-on"), Education featuring the use of sequenced behavioral objectives combined into interdisciplinary units with the teacher playing the role of designer and resource person. Arguments in favor of this approach are presented in the form of seven postulates and six propositions.

It is hoped that SCOPE in its two years of activity has produced material that will influence curriculum development in this country during the '70s in the direction of being systematic, interdisciplinary, self-improving, and allow the student the maximum latitude in meaningful choice and direct and relevant experience. It is further hoped that the architects of these curricula will be talented professional people from public schools, universities, State-supported curriculum labs, and the private sector working hand-in-hand.

PROLOGUE

The original SCOPE proposal listed the following four objectives as those defining SCOPE (PHASE I):

(1) To establish a communication link between the State-supported vocational curriculum centers which would include the following:
   a. Publication of a statement describing the activities and curriculums of each for distribution among the centers and interested parties at large;
   b. Bringing together of personnel from each Center to discuss the process of curriculum and media development and the activities of each;
   c. Bringing together of personnel from each Center to expose them to the latest developments in curriculum theory and educational technology.

(2) To develop more fully and refine a scheme for reorganizing educational objectives in terms of the behavioral process used to accomplish each objective and the object of the process in each instance (the process-object model).

(3) To give the finalized process-object model a preliminary test on a small sample of behavior to determine its applicability and breadth.

(4) To develop a staff capability and a detailed program of planned curriculum undertakings to launch the SCOPE Center which would carry out PHASES II and III.

The project was originally funded on June 24, 1968. Now some 26 months later we are ready to account for our time, accept credit for our successes, however serendipitous, and show contrition for our mishaps.

Our first objective was accomplished with reasonable success and speed during our first year, and about as planned. Two conferences were held for curriculum lab people during that year and an organization was formed. The second conference brought together outstanding contributors to instructional material development; their presentations formed the basis for a conference proceedings: Recent Innovations in Curriculum Design

and Instructional Materials, published by SCOPE. Our activity toward the attainment of the first objective constitutes Part II of this final report.

Our second objective referred to the development of a scheme for reorganizing educational objectives in terms of process (thus, making the curriculum interdisciplinary) while our third objective referred to testing this scheme on a sample of behavior (presumably a sample of behavioral objectives). These two objectives formed the basis for the bulk of activity undertaken in this project. The second objective formed the basis for the development of a taxonomy which was reported on in an incidental report and described at a meeting of the American Educational Research Association. This report has been incorporated into Part I of this report. On the theoretical side, it is likely to be remembered as the most significant contribution of SCOPE.

The third objective necessitated our first departure from the original plan. It was thought that the model developed in objective two might best be tested by trying to use it to classify some behavioral objectives, thereby transforming them from subject-matter-oriented objectives to process-oriented objectives. To this end, the following criteria were developed to assess the adequacy of an educational-objectives classification system (such as that to be produced in objective two):

(1) The categories must be able to be described operationally (using operations relevant to the objectives). It must be possible for independent coders to classify objectives into the categories with the same outcome (reliability).

(2) As a result of classifying educational objectives from different subject matters into the categories, differentiation of subject matters must be provided such that both communalities and differences among subject matters are identified.

(3) The communalities identified via classification must be relevant (i.e., meaningful) for both education and life (validity).

Testing our model by trying it out on objectives was consistent with an overall program of activities sponsored by (and planned by) the U. S. Office of Education. This plan called for

discipline-oriented groups in a wide variety of disciplines to receive contracts under which they would describe the application of their discipline in the secondary schools in terms of behavioral objectives. When these projects were completed, the result would be a complete list of all secondary school goals in behavioral terms. However, these goals would be subject-matter-oriented. To make the secondary school curriculum an interdisciplinary one, SCOPE was funded to design a model for reorganizing and reorienting this total pool of objectives (objective two). It therefore made good sense for us to test this model on the objectives that the other contractors were generating (objective three).

However, there were two hitches. The first was a change in U. S. O. E. plans such that all of the contracts described above were not let.* The second was that those groups that had received contracts were not ready with behavioral objectives when we were ready to test the model.

Therefore, we had to develop a different plan for testing the model. We turned to the plan described in Part I of this report. We developed three kinds of measures, aptitude measures, competency test measures, and competency ratings, and administered each to a group of secretarial trainees and a group of technician trainees. Factor analyses were undertaken to see whether performance by these two groups was divisible into the four domains of the taxonomy. Intercorrelational analyses were also undertaken to determine the relationships between these measures. These procedures and results are described in Part I.

Our fourth objective was pursued perhaps more in a theoretical than in a practical way. Planning for our future took two forms: establishing a philosophy, and attempting to implement an operational plan. Some background would be helpful in pursuing this discussion. At the time that U. S. O. E. planners were laying plans for the development of an interdisciplinary curriculum, they also decided to create a network of schools to try out this curriculum once developed. Eighteen school dis-

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* The strategy shifted from one of writing these objectives to one of collecting and banking them, an activity undertaken by Dr. James Popham at UCLA. However, his bank did not have many objectives ready for dissemination at the time we were ready to test.

tricts were brought together under the rubric of Educational Systems for the Seventies (ES '70).

The relationship between SCOPE and ES '70 was never formalized* but was close nevertheless, based on mutual interest. Through this interaction a plan for the future of SCOPE evolved. This plan was to be tested by a project jointly undertaken by SCOPE and one of the ES '70 schools (Willingboro) as a kind of feasibility study. The plan was designed and is described in Part IV of this report along with its outcome. The plan was never tried since it depended on Willingboro obtaining State funds to subsidize teachers' time. Unfortunately, these funds were never forthcoming.

Our second stroke at perpetuity was to develop a statement of philosophy for the curriculum movement in the secondary school. This philosophy of the student-centered curriculum is the topic with which Part V of this report is occupied.

We undertook one project beyond those set forth in our original proposal. This project dealt with ability-grouping in the secondary school. We reasoned that the interdisciplinary curriculum, our major project orientation, was a strategy for dealing with student diversity in the school. As such, it should ultimately come to replace the existing strategy for dealing with diversity, homogeneous ability-grouping. While we worked to hasten the birth of the interdisciplinary curriculum, we thought we might hasten the demise of ability-grouping by identifying some of its shortcomings. Thus, we undertook to review the ability-grouping literature and to study the relation between some parameters in the school that would help us make inferences about ability-grouping's greatest fault — its locking in or self-perpetuating feature. These activities constitute Part III of this report.

Thus, as you turn the page and begin ranging through this report you will see that it ranges through a taxonomy for reorienting educational objectives, to activities for directors of State-supported vocational curriculum labs, to homogeneous ability-grouping, to the design of a short-term program for

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* On one occasion we were formally authorized by U. S. O. E. to attend an ES '70 meeting. We typically were present at many of these meetings anyway and always circulated our materials to ES '70 schools.

implementing an interdisciplinary curriculum, to a philosophy of instruction. This, then, (is, was) SCOPE...

Part I The Development and Testing of a Taxonomy for Classifying Educationally-Relevant Behaviors

INTRODUCTION*

1. Background

Education has, of late, shown greater concern than heretofore with the issue of relevance. Educational developers have also shown a greater awareness of the psychology of individual learning and development and have, upon occasion, sought to have their innovations reflect this awareness. Such concern is best put into practice with the aid of some scheme which specifies the characteristics of the learning process and the areas in which learning may take place. Approaches such as those of Bloom (1956), Krathwohl (1964)**, and Gagne (1965), have been used as the basis for organizing instructional activities.

This paper proposes a broader more comprehensive scheme than the above with implications for both the structure and dynamics of learning. Rather than focusing on a single psychological domain (e.g., cognitive), the proposed taxonomic model includes "all" four psychological domains, viz., perceptual, cognitive, affective, and psychomotor. Thus, psychological domain becomes the first factor or dimension of the scheme. The second dimension is process and four have been enumerated: acquisition, application, evaluation, and communication. The thinking here is that in the learning process, first you acquire a skill or concept, then you apply it, then evaluate it, and finally communicate about it or with it. The third dimension is object with three being identified — ideas, objects, people. The object is that on which the

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* The INTRODUCTION section of this part of the report originally appeared as Incidental Report #4 of the SCOPE Project under the title: "A taxonomy for classifying educationally-relevant behaviors." This section was also reported on at the Minneapolis meeting of the American Educational Research Association.

** These taxonomies along with the taxonomy developed by Yagi et al. (1968) appear in APPENDIX I-A.

process is performed.

Thus, the domain-process-object model (see Figure I-1) has 48 cells (4 x 4 x 3) each of which has possible functional properties. The value of the model as presently seen is to classify educational objectives into units or clusters for teaching purposes which have more intrinsic comparability than those grouped by subject matter.

A description of each of the subfunctions for the acquisition process in each domain is given below. Included with the descriptions are possible tests for use in measuring each subfunction.

2. The Elements of the Taxonomy

PERCEPTION

Acquisition

Sensing - be aware of the presence (or absence) of stimuli via the body senses

A typical task requires the subject to actively use his senses of sight, sound, smell, touch, taste and (internal) feeling to indicate perceived sensations (at time of event or later) by

1. self-report
2. questionnaire
3. interview
4. acting out (verbally or physically)

Attending - continue to sense ongoing or intermittent stimuli

A typical task requires the subject to keep receiving perceived stimuli and report (by means noted above)

1. if the stimuli continues to be observable
2. if the stimuli disappears or reappears

Figure I-1

THE DOMAIN-PROCESS-OBJECT MODEL
FOR
CLASSIFYING BEHAVIORAL OBJECTIVES

Domain / Process	ACQUISITION	APPLICATION	EVALUATION	COMMUNICATION
PERCEPTUAL	sensing attending resolving distinguishing recognizing	detecting monitoring scanning tracking	comparing kinesthesing	discriminating
COGNITIVE	memorizing associating conceptualizing processing creating	computing ordering trouble-shooting decision-making problem-solving	diagnosing	coding speech-writing translating
AFFECTIVE	experiencing (introspecting) orienting valuing (cathecting) integrating	interpersonal managing empathizing self-motivating		acting
PSYCHOMOTOR	reacting (effecting) adjusting (modifying) coordinating habituating	anticipating manipulating adapting		transmitting

Things
Ideas
People

Resolving - determine presence of individual (or grouped) stimulus within the given array of stimuli

A typical task requires the subject to perceive separately any figure(s) from the background of the stimuli by

1. "searching" the perceived stimuli area and reporting distinct objects not part of the stimulus field

Distinguishing - determine differences among stimuli or change in perceived stimuli (into predetermined categories)

A typical task requires that the subject, when presented with more than one stimulus simultaneously

1. report if they are the same or different
2. report if one (or more) stimulus changes in one (or more) dimension(s)

(Where the subject is given only one stimulus, he reports any perceived difference in terms of type and degree)

Recognizing - differentiate into predetermined categories the perceived stimuli

A typical task requires the subject to attend to the presented stimuli and classify them, reporting

1. identifiable forms
2. identifiable patterns

PERCEPTION TESTS

Acquisition

Sensing - Present card with given number of dots. Ask Ss to tell you how many there are. Time — 3 seconds.

Attending - 80 slides presented 3 times each at high speed on a Carousel Projector. 3 slides have dots. S must identify number of slides having dots.

Resolving - Copying Test (French Cf-3 Flexibility of Closure). Time - 8-10 minutes.

Distinguishing - Number Comparison Test (French P-2 Perceptual Speed). Time - 5-7 minutes.

Recognizing - Finding A's Test (French P-1 Perceptual Speed). Time - 5-7 minutes.

COGNITION

Acquisition

Memorizing - name the components of the previously presented material

A typical task requires the subject to attend to the stimuli (S) presented (visually, auditorily, etc.) and then "reproduce" the S by

1. free recall of S (e.g., nonsense syllables)
2. recognition of S in newly presented material (e.g., nonsense syllables)
3. recalling material partially forgotten and then relearned

Associating - name the components/material that preceded/followed a given S

A typical task requires the subject to attend to the S presented and then "reproduce" the S by

1. serial learning
2. paired association
3. recall followed by free association
4. paired comparisons (e.g., which pairs came first?)

Conceptualizing - identify the basic concept (essence, similarities/differences, relationship)

A typical task requires the subject to attend to the S presented and then

1. to group items by their common properties (classify)
2. determine the operating hypotheses by classifying items, and when given feedback as to the correctness of proposed hypotheses, modify them until principle is attained

Processing - distinguish the basic properties or operating hypotheses

A typical task requires the subject to attend to the S presented and then

1. determine the essentials of S by testing possible hypotheses according to some strategy
2. differentiate - all the possible uses of the particular S (e.g., string)
3. take S as presented in a given grouping and regroup them, based on other principles (e.g., Bloom Test)
4. construct a relationship among the parts of the S (e.g., given 10 words, make up a story using them as the base).
5. determine the relationship for a given set of S, using other interrelated S as basis (e.g., analogies)

Creating - generating numerous novel and adaptive responses to given stimuli or stimulus situations

A typical task requires the subject to generate, when given a common situation or object, as many novel yet appropriate (adaptive) reponses as he can. Novelty may be judged in terms of the frequency of a response in a pool of responses across subjects.

COGNITION TESTS

Acquisition

Memorizing - First and Last Names Test (French Ma-3 Associative (rote) Memory)

Time - 12-15 minutes

Associating - Controlled Associations Test (French Fa-1 Associational Fluency)

Time - 15-18 minutes

Conceptualizing - Expressional Fluency Test (French Fe-1 Expressional Fluency)

Time - 12-15 minutes

Processing - Ship Destination Test (French R-3 General Reasoning)

Time - 20-22 minutes

Creating - Alternate Uses Test (French Xs Semantic Spontaneous Flexibility)

Time - 15 minutes.

AFFECTIVE

Acquisition (Feeling)

Experiencing/introspecting - be directly and personally impressed by events which produce self-observed feelings

A typical task requires the subject to attend to the stimuli presented (internal sensations) and then identify and label his emotions and feelings (at time of event or later) by

1. interview
2. self-report
3. questionnaire
4. acting out (verbally or physically)

Orienting (selective attention) - assume a mental position which seeks preferred (valued) objects

A typical task requires the subject to attend to (potentially attractive) stimuli presented (at variable rates) and then "flag" those that appeal to him by

1. voicing a preference or (hierarchy of) selection re S that interest him
2. executing a psychomotor act which designates S that he desires (this may or may not directly select or focus on desired S w/o any intervention by the E)

Valuing (Cathecting) - associate/attach an emotion or value to some idea, object, event or person

A typical task requires the subject to assume a positive or negative valence concerning the (confronting) stimuli by

1. vocally or physically accepting or rejecting presented item(s)
2. actively seeking further exposure to or avoiding presented items (either specifics or genre)
3. participating in activities designed to state or promote espoused values

Integrating - incorporate value-laden experience into one's value system such that the system changes to accommodate experience(s)

A typical task requires the subject to conceptualize the value and integrate it by

1. abstracting properties of concept (value) involved by analysis and differentiation, developing an evaluative judgment of its worth, and generalize about a set or class of values of which the valued object is a member. This results in a hierarchial placement of the value.

AFFECTIVE TESTS

Acquisition (Feeling)

Experiencing/introspecting - An Evocative Picture - Ask subject "How does it make you feel?" Give him a list of "feeling" words pre-scaled for level of feeling.

Time - 7 minutes.

Orienting - The Least Preferred Coworker Scale developed by Fiedler (1967) measuring social vs. task orientation.

Time - 10 minutes.

Valuing (Cathecting) - Give S tintypes of persons with problems. Have S evaluate these persons using the evaluative dimensions of the semantic differential.

Time - 10 minutes.

Integrating - Kohlberg (1967) material - Value-Conflict See how subjects can resolve a moral dilemma.

Time - 35-40 minutes.

PSYCHOMOTOR

Acquisition

Reacting (effecting) - respond to stimulation by executing (gross and/or fine) psychomotor movements (the type of response must be predetermined)

A typical task requires the subject to show that he has perceived predetermined stimulation by engaging in (pre-established modes of)

1. facial/body movement involving partial or entire use of the face, trunk and limbs

Adjusting (modifying) - change type and degree of psychomotor movements shown or instructed

A typical task requires the subject to moderate his facial/body movements (in order to perform more efficiently) by

1. imitating a model which portrays the desired action
2. engaging in randomized motions
3. increasing or decreasing the force and area of movement

Coordinating - sequence predetermined movements so as to perform them efficiently

A typical task requires the subject to order his motions by

1. moving in a predetermined manner so as to maintain either the continuity or the sequence of discrete unit movements

Habituating - performs movements skillfully without conscious intervention

A typical task requires the subject to acquire "automatic" responses to predetermined stimuli by

1. continuing to adjust and coordinate his movements
2. repeating the motor responses until they are executed correctly, with as much speed and detail precision as is practical

PSYCHOMOTOR TESTS

Acquisition

Reacting - Connecting dots on a circle

Time - 3 minutes

Adjusting - Pencil Maze from Wechsler Intelligence Scale

Time - 10 minutes

Coordinating - Star tracing test

Time - 3 minutes

Habituating - Performance on the Star test 10 times with the 11th being the criterion

Time - 5 minutes

3. Testing the Validity of the Taxonomy

The validity of the domain-process model is dependent on the identification of its elements in human behavior. If the common elements of occupationally-relevant tasks coincide with the domains and processes included in our model, then we would judge it to be valid and useful.

There has been much research done in the past to identify "clusters" of occupations. However, the major criteria used for clustering has been some variant of the job analysis technique. Useful as this technique has been, the increase in number and diversity of occupations in recent years has made it impossible for schools to train students for all the "job clusters." One theoretical position upon which the domain-process-model is based is that identifying the domains and processes of behaviors required in various occupations provides a more comprehensive means of identifying clusters of occupations. In addition, it is postulated that these psychologically defined clusters would facilitate the integration of "academic" and "vocational" subjects into an occupationally relevant student-centered curriculum. Some initial work has been done in identifying communalities among occupations with respect to the psychomotor and cognitive domains.

To test the model, we selected a sample of secretaries and technicians. The secretary designation applies to those persons who perform general functions such as scheduling appointments, giving information to callers, taking dictation, and otherwise relieving officials of clerical work and other minor administrative and business details (U.S. Government Printing Office, 1965). The term technician is meant to apply to a worker who directly supports engineers or scientists, utiliz-

ing theoretical knowledge of fundamental scientific, engineering, mathematical, or draft design principles (U.S. Government Printing Office, 1965). Both groups were students completing their training as either secretaries or technicians.

Tasks which are relevant to each of the two occupations were identified from available job analyses. From these lists, tasks from each occupation were selected on the basis of their being dominated by two of the four domains of our model. For example, proficiency in typing would appear to be dominated by behaviors which are perceptual and psychomotor. Performance measures for the appropriate tasks were obtained from each person in the two samples.

The performance data on the ten tasks was intercorrelated across individuals within groups yielding two 10 x 10 correlation matrices. The covariance structure of each matrix was investigated by means of a factor analysis. The validity of the domain-process model was judged in part on the degree to which the empirical factor structure agreed with the elements of the model. For example, can the common cognitive element be identified factorially from those tasks containing such an element?

The above procedure tests the extent to which the domain elements in our model can be identified in job-relevant tasks. Another important facet of validity is whether or not tests of the functions described at each level of process within each domain of the model are systematically related to an individual's task performance and overall job competence. To this end, the battery of tests listed in Section II above was administered to each subject in the two samples. The resulting data was explored via correlational analysis.

The design of the study, therefore, included (1) the administration of a battery of tests to secretaries and technicians to determine their aptitudes in each function of the taxonomy. In addition, (2) job-relevant performance data and (3) supervisor's ratings were collected and related to the aptitude data. Patterns within each set of data and relationships between sets of data were examined.

4. Educational Relevance of the Taxonomy

The study proposed in this paper has three important implications for educational curriculums. The first is that

clusters of occupations could be derived based upon psychological concepts. This may provide for broader educational programs which could prepare a given student for a wider variety of occupations. The second is related to integrating academic subjects into the vocational curriculum. Such a procedure would provide for concrete applications of academic concepts thus increasing their immediate relevance. Also, exposure to both the practical and the conceptual in the learning experience would allow for more flexibility of transfer or change of career choice thus avoiding premature closure as is typically the case within current "tracking" programs.

The results of the proposed study will also have implications for curriculum developers. Rather than develop curricula to include what certain individuals "feel" is relevant, the data from our work could provide empirical definition of what skills are relevant for success in various occupations, as well as civic and personal-social areas.

The third relevant application is that a model such as the one proposed, if validated, could become the basis for describing the full range of life-relevant behaviors including the occupational, civic, and personal-social areas. Such a descriptive framework would lend itself to the development of "achievement" type tests to assess an individual's competency in any range of behaviors appropriate to his job and life as well as perhaps being able to predict such success before the fact. Thus, tests developed from the model could serve predictive, diagnostic, or evaluative purposes.

The model provides a framework for combining or integrating behavioral objectives and forms the basis for interdisciplinary curriculum organization. If the subfunctions can be demonstrated to bear the hierarchial relationships hypothesized in the taxonomy, it can become a useful tool for educational development in students. Affective development, for instance, would be accomplished by providing students with experiences aimed toward developing their ability to introspect. Once this skill had been developed, orienting activities would follow. The next step would deal with valuing, and finally integrating activities would be included. Thus, the model would be a "map" for the prescription of learning experiences to produce individual development in each domain.

PLAN OF THE STUDY

Because of the size and complexity of the study to be undertaken, it was decided to utilize Program Evaluation and Review Techniques (PERT). A diagram of the network of activities for evaluating the taxonomy appears in FIGURE I-2 with a listing of these activities in TABLE I-1.

The overall plan of the study for testing the taxonomy was to administer to a group of secretaries and a group of technicians the following:

(1) A battery of aptitude tests measuring the functions of the taxonomy (these have been listed above).
(2) A battery of occupational competency tests measuring occupational skills across the four domains.
(3) A set of supervisor ratings assessing judged competence in general and in specific areas.

These sets of data were then each factor analyzed separately and intercorrelated to identify patterns and relationships. Essentially the following three questions were addressed by the analyses:

(1) Do the aptitude tests display a factor structure which is consistent with the taxonomy (i.e., four domains as specified)?
(2) Do the occupational competency tests display a factor structure which is consistent with the taxonomy (i.e., four domains as specified)?
(3) Does aptitude test performance predict occupational competence as measured by the occupational competence tests and supervisor ratings?

METHODS

1. Sample

The technician sample consisted of 36 men between the ages of 18 and 21 who were attending the United States Army Signal School and were enrolled in a 23 week course in strategic micro-

FIGURE I-2

PERT Network of Activities for Evaluating Process-Object Model

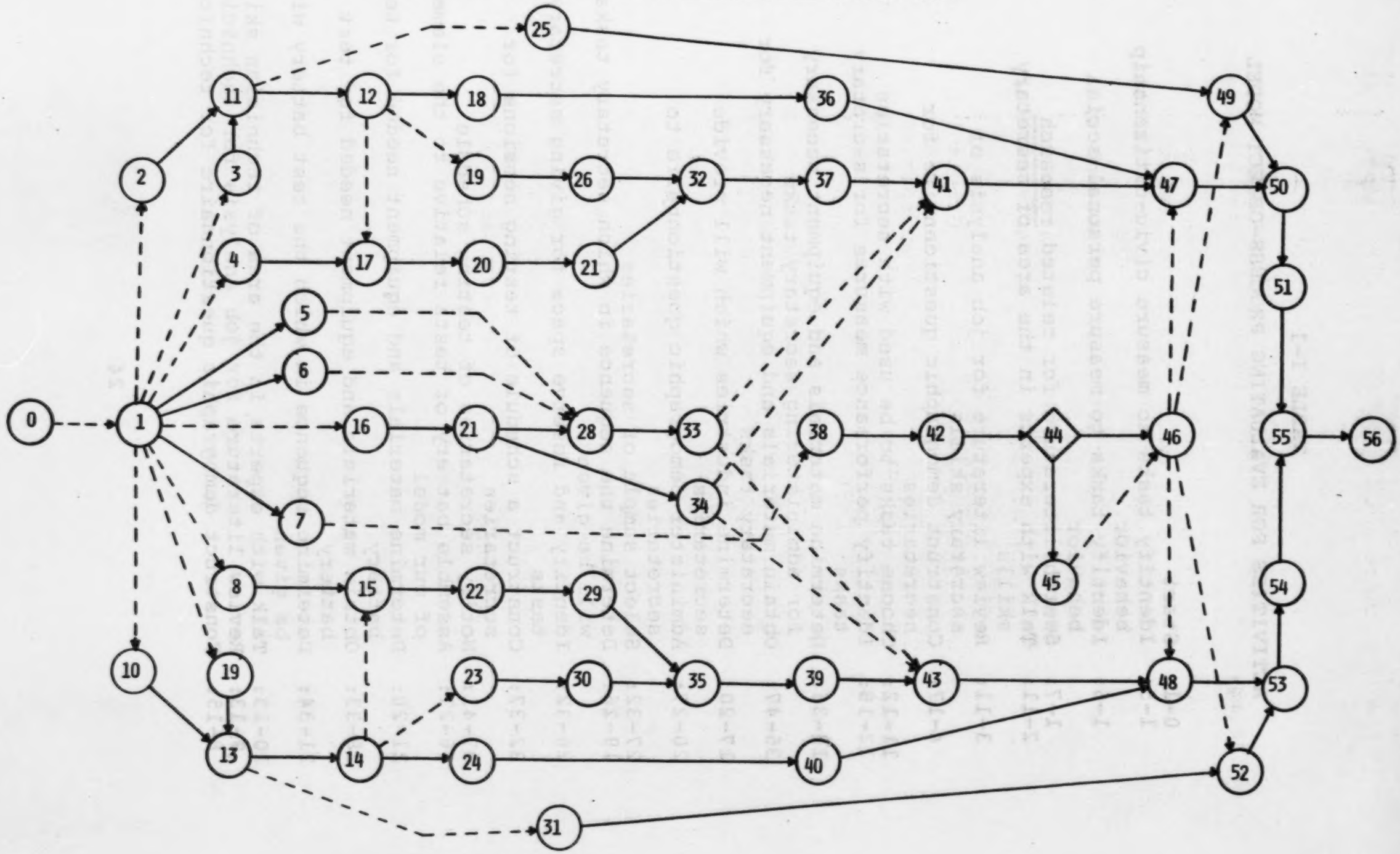

TABLE I-1

ACTIVITIES FOR EVALUATING PROCESS-OBJECT MODEL

0-1:	Start
1-5:	Identify tasks to measure civic-citizenship behavior
1-6:	Identify tasks to measure personal-social behavior
1-7:	Search literature for related research
2-11:	Talk with experts in the area of secretary skills
3-11:	Review literature for job analysis of secretary skills
4-17:	Construct demographic questionnaire for secretaries
11-12:	Choose tasks to be used with secretaries
12-18:	Identify performance measures for secretary tasks
18-36:	Determine materials and equipment necessary for administering secretary tasks
36-47:	Obtain materials and equipment necessary for secretary tasks
17-20:	Determine industries which will provide secretaries
20-27:	Administer demographic questionnaire to secretaries
27-32:	Select sample of secretaries
19-26:	Determine the sequence in which secretary tasks will be given
26-32:	Identify and reserve space for giving secretary tasks
32-37:	Construct a schedule of testing sessions for secretaries
37-41:	Notify secretaries of testing schedule
16-21:	Assemble battery of tests relative to the elements of our model
21-28:	Determine materials and equipment needed for test battery
28-33:	Obtain materials and equipment needed for test battery
21-34:	Determine sequence in which the test battery will be given
10-13:	Talk with experts in the area of technician skills
9-13:	Review literature for job analysis for technicians
8-15:	Construct demographic questionnaire for technicians

13-14: Choose tasks to be used with technicians
14-24: Identify performance measures for technicians tasks
24-40: Determine material and equipment needed for giving technicians tasks
40-48: Obtain materials and equipment needed for giving technicians tasks
15-22: Determine industries which will provide technicians
22-29: Administer demographic questionnaire to technicians
29-35: Select sample of technicians
23-30: Determine the sequence in which technicians tasks will be given
30-35: Identify and reserve space for giving technicians tasks
35-39: Construct a schedule of testing sessions for technicians
39-43: Notify technicians of testing schedule
41-47: Administer test battery to secretaries
43-48: Administer test battery to technicians
38-42: Identify statistical procedures to be used in the data analysis
42-44: Determine what computer programs are available for analyses
44: Decide whether new computer programs will need to be written
44-45: Write the new computer programs (also debug)
44-46: Plan the data format to be used in the statistical analyses
25-49: Determine how to measure occupational competence for secretaries
49-50: Obtain measures of occupational competence for secretaries
47-50: Obtain task performance data from secretaries
50-51: Roster secretary data and prepare for analyses
51-55: Analyze secretary data
31-52: Determine how to measure occupational competence of technicians
52-53: Obtain measures of occupational competence for technicians
48-53: Obtain task performance data from technicians
53-54: Roster technician data and prepare for analyses
54-55: Analyze technician data
55-56: Write up report of results

wave systems repair. These 36 Ss were scheduled to complete the course within a week after the testing, thereby qualifying them as technicians in the microwave (electronics) field. Ss' education ranged from high school dropout to college graduate with the majority of Ss being high school graduates.

The secretarial sample consisted of 38 women between the ages of 18 and 21 who were attending one of two two-year community colleges where they were studying secretarial science. Of the 38, 14 were completing their second (and last) year at one of the colleges while 24 were completing their first year at the other.*

2. Tests of the Functions (Aptitudes) Within the Taxonomy

The aptitude battery consisted of 18 tests (see INTRODUCTION- Section II) and took approximately four hours to complete. Of the 18, seven were "homemade," eight were taken from the French et al. (1963) Kit, and three were taken from other sources.

On the eight French Kit tests (Copying, Number Comparison, Finding A's, First and Last Names, Controlled Associations, Expressional Fluency, Ship Destination, and Alternate Uses Tests) testing time was cut in half by using only the first part of the two parallel parts presented in the tests. This reduced testing time but unfortunately at the expense of reliability and validity.

Each of the 18 tests is briefly described below.

a. Count the Dots (Sensing) — 25 dots on a card; S must count them in 3 seconds
b. Count the Moving Dots (Attending) — 3 of 80 slides presented at high speed on a Kodak Carousel Slide Projector contain dots. The series is repeated three times. S must report the number of slides with dots. To do this, he must maintain his attention.
c. Copy Test (Resolving) — in this French Kit test S must copy an irregular pattern over a matrix of dots.
d. Number Comparison Test (Distinguishing) — in this French Kit test S is given a series of pairs of numbers (from 3 to 12 digits each) and must indicate whether the

* The original plan called for obtaining a sample of secretaries from industry. Unfortunately, the cooperation of industry could not be secured.

numbers in the pair are identical or not.

e. Finding A's Test (Recognizing) — in this French Kit test S is given lists of words. He must draw a line through any word that contains the letter "a."

f. First and Last Names Test (Memorizing) — in this French Kit test S is given a list of names to memorize; he is given the last names and must reproduce the first names.

g. Controlled Associations Test (Associating) — in this French Kit test S is given a word and must write as many synonyms of the word as he can think of.

h. Expressional Fluency (Conceptualizing) — this test from the French Kit was developed by Christensen and Guilford; in it S is given four letters which he must use as the first letters of four words which he generates to make a complete sentence; moreover, he must use them in the order in which they are given.

i. Ship Destination (Processing) — this test from the French Kit was also developed by Christensen and Guilford; S must determine the shortest distance between two points taking additional information into account; it requires convergent thinking.

j. Alternate Uses (Creating) — this test from the French Kit was developed by Christensen, Guilford, Merrifield, and Wilson; S is given the name of a common object (e.g., button) and must list as many alternate uses for it as he can think of; it requires divergent thinking.

k. Emotional Introspection Test (Experiencing) — this test was developed for this study; S is shown three large photographs which were chosen to evoke emotion and given a list of reactive adjectives (e.g., delighted, mad, pensive); S selects the adjective that best describes the feeling evoked in him by each photograph; the adjectives were first rated by another group as to their degree of emotion; S is scored in terms of the "emotionalness" of his response.

l. Least Preferred Coworker (Orienting) — this test was developed by Fiedler (1967); S is given 16 evaluative, semantic differential scales and asked to rate his least preferred coworker; high scorers show a social orientation, low scorers a task orientation.

m. Tintype Test (Valuing) — this test was developed for this study; S is given three "thumbnail" sketches; i. e., verbal descriptions of three different people and asked to rate each on 15 evaluative, semantic differential scales; S's score is the positiveness of his re-

actions or ratings.

n. Moral Dilemmas Test (Integrating) — this test was developed by Kohlberg (1967); S is given four situations where positive and negative values are in conflict (e.g., mercy killing) and is then asked questions to indicate his resolution; open-ended questions are scored from a manual with more relative, mature responses receiving higher scores than more absolute, immature ones.
o. Connect the Dots (Reacting) — this test was developed for this study — S is given 12 circles each having 4 dots on its perimeter; S has 80 seconds to draw lines between each of the dots on each circle.
p. Maze Test (Adjusting) — this test is part of the Wechsler Adult Intelligence Scale (WAIS); S is given 6 pencil mazes and must draw a continuous line through each from start to finish in 8 minutes.
q. Star Tracing Test (Coordinating) — this test was developed for this study; S is given a picture of a star with a double outline; S can only see the star through a mirror and must trace a line between the true outlines of the star; score is the number of crossings outside of the outline.
r. Repeated Star Tracing Test (Habituating) — this test was developed for this study; S is given the Star Tracing Test (see above) 4 times; his score is the amount of improvement from time 1 to time 4.

3. Secretarial Competency Battery

The secretarial competency field has been examined in some detail. The work of Cook and Shapiro (1968), Perkins, Ross, and Roley (1967), and Huffman et al. (1968) was helpful in identifying secretarial tasks and classes of tasks. Moreover, the Certified Professional Secretary Examination developed by the Institute for Certifying Secretaries of the National Secretaries Association is a clear operational statement of secretarial competence after which we patterned our own battery.

Our battery consisted of seven tests. Each is described below.

a. The In-Basket Test — (developed by Perkins, Byrd, and Roley, 1967) S is given 10 in-basket items ranging from telephone messages and memos to letters and requisitions. All are items directed to her boss but he has gone away. S must make two kinds of decisions about each item —

first its priority, and second whether she can or cannot do it herself. (It is anticipated that cognitive and affective skills will be required for this test.)

b. The Alphabetic Filing Test — (developed by Turner, 1967, pp. 136-141) S is given a series of references and then of names. In the case of the references, S must choose the correct file designation. In the case of the names, S must put a given name in the proper alphabetical order. (cognitive and perceptual)

c. Copying From a Corrected Rough Draft — (developed by Turner, 1967, p. 120) S is given a rough draft of a manuscript with corrections and must type a corrected copy. (perceptual and psychomotor)

d. Arranging and Typing a Table — (developed by the Institute for Certifying Secretaries and used with their written permission) S is given some information and instructed to type this information up in tabular form according to given instructions. (cognitive and psychomotor)

e. Proof Reading a Typed Manuscript — (developed by SCOPE) S is given a typed manuscript containing errors and must identify the errors and indicate the corrections to be made. (perceptual and cognitive)

f. Typing a Dictated Letter — (developed by Turner, 1967) S is read aloud a verbatim transcript of a dictated letter at the rate of 80 words per minute and must type one accurate copy of the letter. (cognitive and psychomotor)

g. Problems in Secretarial Practice — (developed by the Institute for Certifying Secretaries and used with their written permission) S is given 16 problems of the type that confront secretaries. Each is of the multiple choice variety and each has four choices. Twenty minutes is allowed for this test. These problems are not problems of fact but problems of judgment in time management, human relations, priorities, etc. The first problem appears below as an illustration.

> 1. One of the supervisors reporting to your employer frequently takes a day off and charges it to vacation time or to personal business, both of which are permissible under company policy. However, he has a habit of doing this without giving advance notice to your employer. He calls early in the morning before your employer's arrival

and reports to you that he is taking the day off. You are aware that this disturbs your employer. The supervisor has told you about his personal problems which require his absence on short notice. You should

___ A) continue to deliver the messages from the supervisor without interfering in a personal problem.

___ B) forget to report the absence to your employer unless he inquires about the man.

___ C) speak to the supervisor about taking your employer into his confidence.

___ D) tell your employer about the supervisor's personal problems.

(This test seems to tap <u>cognitive</u> and <u>affective</u> skills.)

4. Technician Competence Battery*

The technician competence battery in strategic microwave systems repair is built right into the training program at the U.S. Army Signal School. It consisted of six written tests and seven performance tests. Written tests dealt primarily with cognitive aspects of the tasks and required trainees to do such things as draw circuits and solve circuit problems. All scoring was objective. These tests have been subjected to item analyses and high reliabilities have been reported.

The performance tests required trainees to carry out a set of activities on a piece of equipment. For each performance test, instructors had an "administrator's instruction sheet" which specified the purposes of the test, the equipment to be used, procedures for test administration, tasks to be completed by the trainee, and scoring procedures. Performance tests typically took the form of giving the trainee a piece of equipment with two malfunctions or "faults." The trainee was to use available test equipment to locate the faults within an allotted period of time. The trainee was typically graded on his selection, calibration, and application of test equipment, his procedures used in locating the faults, and in his ultimate localization of the faults. Typically, each test involved two faults and the trainee earned five points for correctly locating each fault (i.e., five points per fault), five points for the use of test equipment, and five points for his troubleshoot-

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* Information about possible technician competency and skill clusters is found in Mills and Rahmlow (1966) and Schill and Arnold (1965).

ing procedure. A maximum score of 20 points could thus be obtained. (A sample ADMINISTRATOR'S INSTRUCTION SHEET appears in APPENDIX I-B.)

5. Biographical Data

Each S completed a Personal Data Questionnaire requesting information primarily about educational background. Only the following three types of information were utilized in the analyses:

(1) age
(2) high school curriculum (college prep., vocational/business, general)
(3) level of education (number of years of education)

6. Supervisor Ratings of Secretarial Competence

Supervisors of secretaries (in this case the teacher of the secretarial students in their two-year college program) were given a series of fourteen 19-point rating scales (ranging from poor to average to perfect) and were asked to judge their secretarial students on the following characteristics:

(1) their overall performance (using personal standards)*
(2) their typing skills
(3) their shorthand and transcription skills
(4) their filing skills
(5) their fundamental language skills
(6) their neatness of work
(7) their neatness of desk and office area
(8) their neatness of personal appearance
(9) their ability to meet people
(10) their ability to deal with conflict or frustration
(11) their ability to take criticism
(12) their ability to work harmoniously with others
(13) their ability to follow directions
(14) their attractiveness

The teachers identified their secretarial students by code number rather than by name.

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* This scale and the format for the other scales is based on the work of Cook and Shapiro (1968).

7. Supervisor Ratings of Technician Competence

The instructors in the technician training program were asked to rate the overall technical competence of each trainee (using personal standards) on a 19-point scale ranging from poor to average to perfect. This was the same scale used for rating overall secretarial competence. No other more specific competency ratings were made of technicians.

8. Data Analyses

Seven data analyses were undertaken as follows:

a. Factor analyses
   (1) Factor analysis of scores on the aptitude (function) test battery with secretaries and technicians combined (N = 74).
   (2) Factor analysis of scores on the secretarial competence test battery for secretaries (N = 38).
   (3) Factor analysis of scores on the technician competence test battery for technicians (N = 36).
   (4) Factor analysis of scores on the secretarial supervisor ratings for secretaries (N = 38).

b. Correlational Analyses
   (1) Intercorrelations between all scores (aptitudes, competencies, supervisor ratings) for secretaries (N = 38).
   (2) Intercorrelations between all scores (aptitudes, competencies, supervisor ratings) for technicians (N = 36).
   (3) Intercorrelations between aptitude test scores and overall supervisor ratings for secretaries and technicians combined (N = 74).

RESULTS

1. Factor Analysis of the Aptitude (Function) Test Battery

The results of the factor analysis of the Aptitude (Function) Test Battery appear in TABLE I-2. Seven factors were identified. The loadings of each of the 18 tests on each of

TABLE I-2

Aptitude (Function) Test Battery Factor Analysis
(Factor Loadings)

		Factor 1	2	3	4	5	6	7
P	sensing	.059	.601*	-.010	-.283	-.226	-.069	-.144
	attending	-.054	-.022	.001	.008	-.950*	.005	.006
	resolving	.538*	-.088	.031	-.008	-.092	-.045	.546*
	distinguishing	.564*	-.078	-.284	.071	.296	.178	.134
	recognizing	.104	.062	.055	-.053	.014	.923*	.013
C	memorizing	-.065	.766*	.056	-.041	.034	.161	.095
	associating	.001	.606*	.008	.469*	.108	.174	.180
	conceptualizing	.026	.504*	.477*	.130	.048	-.241	.226
	processing	.788*	.142	-.096	.085	-.257	-.089	-.174
	creating	.301	.455*	.014	.513*	-.033	-.333	-.063
A	introspecting	-.408	.558*	.262	-.144	.152	-.221	.003
	orienting	-.300	.011	-.099	.507*	-.178	.237	-.396
	valuing	.073	-.200	.081	.790*	.029	-.110	.127
	integrating	-.034	.161	-.162	.096	.035	.065	.860*
Ψ	reacting	-.236	-.157	.707*	.072	.000	.150	-.048
	adjusting	.717*	-.092	-.065	-.060	.200	.084	.123
	coordinating	.090	.152	.794*	.035	-.063	.060	.013
	habituating	.214	-.140	-.763*	.087	-.053	.125	.167

*Factor loading >.450

NOTE: The habituating test is scored in the opposite direction from all the others.

the seven factors appears in TABLE I-2. A summary of the factor structure of the battery appears in TABLE I-3.

The last three factors are highly idiosyncratic and are worthy of only brief mention. The first four factors correspond very roughly to the four domains of the model and will be discussed in more detail.

Factor 1 comes closest to tapping the perceptual domain. Loading highly on this factor are the tests of resolving and distinguishing, both perceptual, along with processing (cognitive) and adjusting (psychomotor). One can argue for the failure of sensing and attending tests to load on this factor. The sensing test consisted of a card with 25 dots on it. It was intended that Ss be allowed only 3 seconds to count the dots so that they would have to roughly sense the number of dots rather than count them systematically. However, on more than half of the testing sessions, the test administrators allowed up to 30 seconds which made counting the dots possible. The resulting easiness of this test may account for its failure to load on the perceptual factor.

Similar problems were occasioned by the use of the attending test. This test was hurriedly designed and involved the use of a Kodak Carousel Projector at high speeds. The Projector continually stuck and jammed and the task turned out to be too easy.

The failure of the test of recognizing to load on this factor is difficult to interpret. It requires Ss to draw a line through all words containing the letter "a." French et al. (1963) report that this test loads on the perceptual speed factor. In this analysis, recognizing accounted for an idiosyncratic factor (Factor 6) by itself.

Two "non-perceptual" tests loaded on this factor. The processing test, Ship Destination, is considered a test of general reasoning, yet it loaded on no other factor but the first. The fact that the problems are given in pictorial form and require some perceptual orientation might account for this outcome. For future uses of the battery, one might do well to use a different, perhaps more verbal, test of processing.

The test of adjusting utilizes the pencil maze. In retrospect, one might argue that the psychomotor task of pushing the

TABLE I-3

Summary of Aptitude (Function) Test Battery Factors

Factor 1	(P)	Factor 2	(C)	Factor 3	(Ψ)	Factor 4	(A)
Resolving	(P)	Sensing	(P)	Conceptualizing	(C)	Associating	(C)
Distinguishing	(P)	Memorizing	(C)	Reacting	(Ψ)	Creating	(C)
Processing	(C)	Associating	(C)	Coordinating	(Ψ)	Orienting	(A)
Adjusting	(Ψ)	Conceptualizing	(C)	Habituating	(Ψ)	Valuing	(A)
		Creating	(C)				
		Introspecting	(A)				

Factor 5	Factor 6	Factor 7
Attending (P)	Recognizing (P)	Resolving (P)
		Integrating (A)

pencil is trivial compared to the perceptual one of distinguishing paths from non-paths; and thus, the pencil maze is, in fact, a perceptual test and belongs on a perceptual factor.

Factor 2 appears to be a cognitive factor including the cognitive tests of memorizing, associating, conceptualizing, and creating. Processing fails to appear, falling instead in the perceptual factor. Two supposed non-cognitive functions intrude on this factor, sensing and introspecting. As was mentioned above, the sensing test was not properly administered. In fact, given its mis-administration (allowing too much time), it may be a test of cognitive strategy (those who count rather than globally sense will do better) rather than perception. Finally, the introspecting test required that Ss select words to indicate their feelings in response to pictures. Lists of words were pre-scored for depth of feeling. This task would certainly have a vocabulary component as well as an associating component (finding the right word to describe an emotion conveyed in a picture). Ss may have used the words not to describe their own feelings but the feelings expressed by the characters in the photograph. People learn what expressions are usually linked with what feelings. Were this the case, then introspecting would have been a cognitive test rather than an affective one.

Factor 3 appears to be a psychomotor factor. It contains three of the four psychomotor tests, with only the pencil maze (adjusting) missing. Adjusting loaded on the perceptual factor and has been described above. The only intruding test is that of conceptualizing with a loading of about .48 (which is well below the loadings of the three perceptual tests on this factor). The only characteristic of this test that would seem psychomotor is the great amount of writing it requires.

Factor 4 can be considered an affective factor. It contains tests of two of the affective functions, orienting and valuing. It does not contain introspecting which, as described above, loads on the cognitive factor. It does not contain integrating which forms a factor essentially by itself (factor 7). It is intruded upon by associating and creating. The associating test calls for S to write as many synonyms for given words as he can. The creating test calls for S to write as many uses for given objects as he can. Both tests would seem to call for imagination, thus giving each an affective component. In fact, it may be more appropriate to classify creating in both cognitive and affective domains.

Tests for the most part not loading on other factors account individually for the three remaining factors. Interestingly, only four of the 18 tests load on more than one factor, three of which having been earmarked for the cognitive domain.

Overall, the factor analysis of the aptitude (function) test battery does provide some confirmation for the domain dimension of the taxonomy while suggesting some refinement and refocusing in terms of test usage.

2. Factor Analysis of the Secretarial Competence Test Battery

The results of the factor analysis of the data from the secretarial competence test battery appears in TABLE I-4. Five factors emerged from the analysis only one of which (factor 5) seemed to fit the taxonomy. Factor 5, containing the three typing tasks (one of which was scored in the opposite direction from the others, resulting in a negative loading), seems to represent the psychomotor domain thus fitting the taxonomy. The other four factors seem highly idiosyncratic with essentially one for each of the remaining, non-typing, tasks. Thus, cognitive, perceptual and attentive factors do not emerge from the secretarial competence battery but a general psychomotor factor does. (One is tempted to consider the first factor perceptual since the typing dictation test involves aural perception (good ears!) while the proofreading task requires visual perception (good eyes!)).

3. Factor Analysis of the Technician Competence Test Battery

The results of the factor analysis of the competence test battery appears in TABLE I-5. Four factors emerged from the rotation of which two, the first two, are significant. The first factor is the written test factor with all six written tests having substantial loadings. The second factor is the performance test factor with five of the seven performance tests having substantial loadings. (It is interesting to note that the first and last performance tests each require a separate factor, suggesting some discontinuity in terms of end effects.)

It may be argued that the written tests are almost exclusively cognitive by virtue of their very nature; thus the first factor is a cognitive factor. The performance tests, on the other hand, largely combine perceptual and psychomotor skills (with a likely cognitive component as well), thus forming a per-

TABLE I-4

Secretarial Competence Test Battery Factor Analysis
(Factor Loadings)

	Factor 1	2	3	4	5
Typing from Draft	-.129	.504*	.218	.098	.722*
Typing a Table	-.132	-.264	-.004	.053	.826*
Typing Dictation	.640*	.112	.067	-.041	-.564*
Proofreading	-.950*	.051	.025	-.017	.081
Filing Test	.000	-.059	.036	.994*	.080
In-Basket	.016	.922*	-.129	-.081	-.121
Secretarial Problems	.006	-.092	.984*	.036	.053

*Factor loading > .450

NOTE: Typing Dictation is scored in opposite direction from others.

Factor 1

Typing Dictation
Proofreading (-)

Factor 2

Typing from Draft
In-Basket

Factor 3

Secretarial Problems

Factor 4

Filing Test

Factor 5

Typing from Draft
Typing a Table
Typing Dictation (-)

TABLE I-5

Technician Competence Test Battery Factor Analysis
(Factor Loadings)

	Factors			
	1	2	3	4
Written test 1	.837*	.146	.187	-.315
Written test 2	.525*	.281	-.286	.351
Written test 3	.828*	.171	-.251	.128
Written test 4	.685*	-.010	.482*	.010
Written test 5	.744*	.152	-.097	.152
Written test 6	.769*	.137	.341	.154
Performance test 1	.035	-.251	.780*	.011
Performance test 2	-.011	.813*	-.240	.077
Performance test 3	.060	.832*	.294	-.023
Performance test 4	.382	.810*	-.092	-.023
Performance test 5	.002	.489*	.648*	-.016
Performance test 6	.359	.757*	-.065	-.140
Performance test 7	.115	-.087	.042	.935*

*Factor loading >.450

ceptual-psychomotor factor. The affective domain is probably minimally represented in the area of technician competence, particularly as measured by the test battery employed in this study.

Overall, the relationship between the factor structure of the technician competence battery and the taxonomy is not as congruent as might be desired. This may be due in part to the absence of an affective component and linking of domain to test medium, i.e., written versus performance.

4. Factor Analysis of the Secretary Supervisor Ratings

The results of the factor analysis of the secretary supervisor ratings appears in TABLE I-6. The "halo" effect is evident by the reasonably high loadings of all ratings on each factor. Two scales, "neatness" and "tidiness", load at beyond .400 on all four factors indicating that they represent general goodness factors (and will not be specifically interpreted). Two other scales, "meeting people" and "taking directions" have loadings beyond .400 on three factors. Where scales load beyond .400 on more than one factor, only their primary loadings will be considered for interpretation.

The four factors that emerged have been labeled appearance, skills, general usefulness, and sociability. Appearance is made up of essentially two scales, appearance and attractiveness. It is the index of a secretary's "looks," indicating how the secretary is perceived. The skills factor includes typing, shorthand, and language ability. The third factor, which has been labeled general usefulness for want of a better name, includes filing, language ability, resolving conflict, and taking directions. It might have been called verbal skills to distinguish it from factor 2 which is primarily psychomotor skills. Finally, factor 4 is sociability with loadings on meeting people, resolving conflict, taking criticism, and working with others. It largely represents the application of one's affective skills to the activities of the office. While the correspondence between these factors and the domains is far less than perfect, there is some degree of overlap.

5. Predicting Secretarial Competence from Demographic and Aptitude Data

Correlations were run between the demographic and aptitude data on the one hand and the secretarial competence test

TABLE I-6

Secretary Supervisor Ratings Factor Analysis
(Factor Loadings)

	Factors			
	1	2	3	4
Typing	.154	.879*	.285	.263
Shorthand	.134	.891*	.167	.278
Filing	.286	.342	.809*	.107
Language	.384	.525*	.630*	.221
Neatness	.446‡	.488*	.452*	.490*
Tidyness	.435‡	.496*	.471*	.460*
Appearance	.739*	.287	.362	.432‡
Meeting People	.437‡	.348	.417‡	.635*
Resolving Conflict	.259	-.020	.674*	.609*
Taking Criticism	.304	.497*	.201	.699*
Working with Others	.233	.475*	.104	.749*
Taking Directions	.488*	.338	.471*	.445‡
Attractiveness	.914*	.102	.254	.208

*Factor loading >.45 ‡Factor loading >.40

FACTORS

Appearance	Skills	General Usefulness	Sociability
Appearance	Typing	Filing	Meeting People
Attractiveness	Shorthand	Language	Resolving Conflict
	Language	Resolving Conflict	Taking Criticism
		Taking Directions	Working with Others

battery on the other. These correlations are reported in TABLE I-7. Typing from a draft relates only to introspecting, and then in a negative direction. Typing a table relates to high school curriculum (college prep students being presumably better at it than vocational or general students). Typing dictation (which is scored as number of errors) relates to processing and habituating. Recall that processing fell on the perceptual factor (see TABLE I-3) and habituating on the psychomotor factor. Thus, typing dictation would seem to have perceptual and psychomotor components.

Proofreading is unrelated to all demographic and aptitude measures while filing related positively to resolving (P), adjusting (Ψ), and coordinating (Ψ). Thus, filing, like typing dictation, is a perceptual-psychomotor task. S must separate the files quickly by eye and then take them out and return them quickly to the correct location.

In-basket task performance related positively to recognizing and integrating and negatively to high school curriculum and orienting. A low score on orienting indicates a task orientation as opposed to a social orientation. Thus, the in-basket task requires a task-oriented person with the ability to integrate values and recognize symbols. This task obviously has an affective component.

The secretarial problems test related only to memorizing and then in a negative direction. It does not help to try to memorize the answers to this test.

Of note is the small number of significant and near-significant correlations between the aptitudes and the tasks and the particular absence of correlations to cognitive aptitudes. This finding is perplexing and difficult to explain.

6. Relation Between Secretary Supervisor Ratings and Aptitude and Demographic Measures

The secretary supervisor ratings show a lot of halo effect. However, we can make some generalizations from TABLE I-8 about what makes a good secretary. (Remember that our secretarial sample consisted of first and second year students in a two-year college secretarial science training programs. The second year students are, on the average, one year older, and, by definition, have had one more year of education. Thus, the correlations between age and ratings and level of education and the ratings simply tell us that the second year students receive higher ratings

TABLE I-7

Correlations Between Demographic and Aptitude Measures And the Secretarial Competence Battery (N = 38)

	Secretarial Competence Battery						
	Typing from Draft	Typing a Table	Typing Dictation	Proof-reading	Filing	In-Basket	Secretarial Problems
Age	.27	.03	.23	.03	-.02	.25	-.01
H. S. Curriculum	-.12	.30≠	-.18	.07	-.16	-.32≠	.14
Level of Educ.	.22	-.15	.24	.02	.15	.28	-.07
Sensing	-.09	.07	-.03	-.12	.01	-.27	-.13
Attending	-.22	-.06	-.09	-.02	-.02	-.22	-.27
Resolving	-.10	.06	.01	.08	.31≠	.13	-.12
Distinguishing	-.06	-.03	.05	.00	-.12	-.20	.13
Recognizing	-.00	-.19	.15	-.09	.12	.29≠	-.24
Memorizing	-.11	-.13	.18	-.02	-.15	.27	-.32≠
Associating	-.22	-.07	.16	.11	.11	.17	-.26
Conceptualizing	.02	.20	-.24	-.04	-.10	.04	-.18
Processing	.31≠	.09	-.35*	.15	.28	-.06	-.22
Creating	.13	.03	-.04	-.16	-.19	.15	-.12
Introspecting	-.40*	-.10	.02	-.24	-.08	-.19	.12
Orienting	.01	-.05	.05	-.08	-.23	-.30≠	.12
Valuing	.03	.15	.10	.09	-.25	-.08	-.02
Integrating	-.06	-.10	.18	-.12	-.16	.30≠	-.10
Reacting	.22	.24	-.19	-.08	.24	.13	-.05
Adjusting	.21	.15	-.01	.02	.49*	.20	.06
Coordinating	-.15	-.12	.02	-.18	.29≠	.01	-.26
Habituating	.12	.01	.33*	-.21	.03	.23	.09

≠p < .10 *p < .05

NOTE: Typing Dictation is scored in the opposite direction from others.

TABLE I-8

Correlations Between Demographic and Aptitude Measures
and the Secretary Supervisor Ratings (N = 38)

	Secretary Supervisor Ratings													
	Overall	Typing	Shorthand	Filing	Language	Neatness	Tidyness	Appearance	Meeting People	Resolving Conflict	Taking Criticism	Working with Others	Taking Directions	Attractiveness
Age	-.01	.00	-.04	.40*	.42*	.19	.29≠	.36*	.24	.16	.16	.10	.27	.47*
H.S. Curriculum	-.03	-.06	.07	-.47*	-.46*	-.31≠	-.32≠	-.43	-.31≠	-.44*	-.21	-.08	-.48*	-.44*
Level of Educ.	.08	.14	.03	.59*	.60*	.40*	.45*	.64*	.50*	.58*	.37*	.19	.61*	.63*
Sensing	.00	.14	.08	.12	.17	.18	.16	.23	.10	.05	.14	.17	.13	.13
Attending	-.08	-.10	-.13	-.25	-.13	.01	-.03	-.01	-.08	-.06	.02	-.05	.08	-.04
Resolving	-.02	.04	.03	-.11	.06	.03	.02	.10	.00	.09	.09	.06	-.07	.07
Distinguishing	.24	.00	.14	-.00	.06	.00	-.03	-.05	.04	.04	-.03	.14	-.09	.00
Recognizing	.12	-.02	.00	.36*	.29≠	.29≠	.27	.17	.37*	.59*	.21	.04	.30≠	-.01
Memorizing	-.12	-.07	-.12	.18	.16	.12	.09	.12	.11	.15	.11	.00	.10	.12
Associating	.06	.07	.08	.19	.25	.06	.04	.11	.17	.25	.14	.03	.14	.07
Conceptualizing	.36*	.28	.39*	.12	.17	.14	.12	-.08	.16	.05	.12	-.06	.00	-.10
Processing	.17	.31≠	.27	.27	.32≠	.19	.20	.19	.16	.20	.08	-.00	.15	.16
Creating	.34*	.30≠	.32≠	.32≠	.41*	.34*	.40*	.46*	.32*	.18	.16	.33*	.34*	.41*
Introspecting	.02	.02	.01	-.33*	-.22	-.08	-.07	-.04	-.15	-.25	-.09	.08	-.21	-.03
Orienting	-.02	-.16	-.12	.12	.12	.02	.06	-.06	.08	.13	.11	-.08	.14	-.10
Valuing	.12	.02	.07	-.08	-.07	.06	.07	.17	.12	.08	.08	.12	.10	.16
Integrating	.29≠	.04	.07	.13	.25	.25	.29≠	.21	.37*	.35*	.41*	.18	.31≠	.06
Reacting	.05	.33*	.25	.39*	.18	.16	.20	.28	.29≠	.16	.23	.01	.14	.11
Adjusting	.07	.04	.03	.18	.08	-.02	-.00	-.07	.30≠	.36*	.25	-.15	.02	-.04
Coordinating	.17	.24	.20	.05	.14	.08	.02	.15	.14	.04	-.04	.14	.01	.16
Habituating	.21	.07	.07	.23	.25	.34*	.34*	.29≠	.27	.39*	.26	.31≠	.35*	.16

≠p <.10 *p <.05

than first year students.)

In general, the good secretary seems to have a high school business education background, and skills in recognizing, creating, integrating, and habituating. Note that each domain is represented by one function from the original taxonomy and that each function is the most advanced (complex) in its domain. This finding may not tell us much other than that the supervisors are looking for the best qualities they can find in a secretary, regardless of the specific relevance of these qualities to the job.

7. Relation Between Secretary Supervisor Ratings and the Secretarial Competence Battery

Some validity for the secretarial competence battery can be obtained by examining the correlations between the tests in this battery and the supervisor ratings appearing in TABLE I-9. Note that the typing rating correlates significantly with each of the three typing tests. Neatness and tidiness ratings correlate with the two typing tests which place an emphasis on the form of the final product. The in-basket test correlates highly with most of the social ratings (e.g., meeting people, resolving conflicts) and with the attractiveness ratings. Why the better looking secretary is better at assigning priorities to the boss's activities is something the reader will have to surmise for himself.

Three of the seven tests in the battery do not relate to the ratings. These are proofreading, filing, and secretarial problems. The validity of these tests must be questioned based on this finding.

8. Relation Between Technician Competence and the Aptitude Battery

Correlations between technician competence scores and rating and scores on the aptitude tests appear in TABLE I-10. No systematic pattern occurs. All of the written competence tests correlate highly with overall rated competence. Negative sensing, attending, and adjusting along with positive associating, valuing, and integrating relate to high written test performance but not consistently across all six written tests.

Only three of the seven performance tests relate to overall rated competence and the pattern of correlations with aptitude

TABLE I-9

Correlations Between Secretary Supervisor Ratings and the Secretarial Competence Battery (N = 38)

Ratings	Secretarial Competence Battery						
	Typing from Draft	Typing a Table	Typing Dictation	Proof-reading	Filing	In-Basket	Secretarial Problems
Overall	.27	.43*	-.25	.16	-.19	.22	.15
Typing	.34*	.48*	-.32*	.15	.08	.14	.06
Shorthand	.36*	.56*	-.30‡	.22	-.01	.13	.16
Filing	.46*	.25	-.06	-.05	-.05	.35*	.01
Language	.38*	.26	-.07	.11	.02	.25	.00
Neatness	.37*	.29‡	-.14	.02	-.12	.31‡	.00
Tidyness	.46*	.34*	-.11	-.03	-.06	.30‡	.08
Appearance	.26	.04	.23	-.04	-.02	.34*	.03
Meeting People	.25	.18	.08	-.13	-.02	.38*	.03
Resolving Conflicts	.34*	.14	.08	-.10	.04	.34*	-.11
Taking Criticism	.22	.30‡	-.00	-.02	.00	.26	.07
Working with Others	.17	.29‡	.17	-.05	-.12	.22	-.04
Taking Directions	.33*	.13	-.12	-.00	-.10	.33*	-.10
Attractiveness	.20	-.06	.25	.16	-.09	.38*	.03

‡p <.10 *p <.05 NOTE: Typing Dictation is scored in opposite direction.

TABLE I-10

Correlations Between Demographic and Aptitude Measures
and the Technician Competence Battery (N = 36)

	Technician Competence Battery													Overall Competence Rating
	Written Tests						Performance Tests							
	1	2	3	4	5	6	1	2	3	4	5	6	7	
Age	.31‡	.19	.24	.06	.28	.11	-.00	-.14	-.06	.10	-.29‡	-.04	.09	.33*
Level of Educ.	.43*	.18	.23	.13	.31‡	.02	-.19	-.08	.01	.18	-.20	.07	-.29‡	.39*
Sensing	-.05	-.24	-.41*	.01	-.54*	.01	.29‡	-.31‡	.03	-.12	.21	-.29‡	-.18	-.17
Attending	-.38*	.00	-.05	-.48*	-.25	-.32*	-.32*	-.04	-.11	-.21	-.32*	-.02	-.06	-.28
Resolving	-.11	-.14	-.14	.04	.15	-.13	.09	-.06	.17	.08	-.00	-.07	.16	.01
Distinguishing	-.09	.16	.07	.01	.12	-.02	-.17	.23	.02	.14	-.01	-.06	-.14	.19
Recognizing	.02	.08	.16	-.08	.02	-.07	-.21	.35*	.12	.24	.07	.19	.03	.07
Memorizing	.22	.06	-.10	.16	-.23	.17	.36*	.00	.10	.06	-.02	-.16	-.26	.13
Associating	.36*	.21	.02	.27	.04	.11	.44*	-.04	.18	.16	-.03	.09	-.17	.24
Conceptualizing	.23	.20	-.03	.19	-.03	-.05	.31*	.08	.24	.10	.10	.04	.01	.13
Processing	.24	.30‡	-.06	.18	-.07	.21	-.09	.06	.02	.16	.06	.04	-.28	.27
Creating	.03	.09	.00	.06	.01	.08	.14	-.00	.10	.06	-.04	.02	.11	.19
Introspecting	.02	.23	-.07	.09	-.26	.09	.36*	-.05	-.07	.16	-.00	-.36*	.23	.04
Orienting	-.10	.14	.10	-.10	.12	-.03	.08	-.08	-.16	-.14	.08	.02	.05	-.02
Valuing	.01	.07	.01	.06	.33*	.08	.06	-.22	-.06	-.18	-.10	.05	.12	.21
Integrating	.30‡	.37*	.21	.23	.19	-.09	.04	.15	.22	.16	-.00	-.00	-.04	.31‡
Reacting	-.16	-.10	.13	-.25	.23	-.07	-.26	.01	.02	.01	-.03	.10	.37*	.05
Adjusting	-.36*	.16	.05	-.05	-.02	-.03	-.28	.26	-.06	.01	-.08	-.09	.21	.01
Coordinating	-.13	-.10	-.11	-.04	-.20	-.09	-.08	.13	.18	.02	.04	.21	-.07	.01
Habituating	.06	-.10	.12	.08	.21	.16	-.04	-.19	-.00	.01	.33*	.00	.06	.14
Overall Competence Rating	.68*	.59*	.69*	.58*	.69*	.75*	.02	.22	.35*	.58*	.27	.44*	.09	—

‡ $p < .10$ *$p < .05$

test scores is even less stable than with the written tests. No strong conclusions can be drawn from this data. The lack of consistency across the tests makes it difficult to make any generalizations.*

DISCUSSION

The discussion will be organized around the three following questions:

(1) Do the data support the taxonomy?
(2) Are the competency measures valid?
(3) Do the aptitude tests predict competency?

1. Do the Data Support the Taxonomy?

To answer this question, four factor analyses were undertaken of the aptitude tests, secretarial competence battery, secretary supervisor ratings, and technician competence battery. Support for the taxonomy would be constituted by the appearance in each factor analysis of four major factors — one corresponding to each postulated domain.

The aptitude test battery factor analysis comes closest to this goal with four major factors appearing bearing some resemblance to the four domains. The factor analyses for the secretarial competence battery and supervisor secretary ratings also generated factors which bear resemblance to the domains. The factor analysis of the technician competence battery generated basically two factors: written tests and performance tests, and thus showed little relation to the taxonomy.

The taxonomy has very strong face validity. It is hard to use data to refute it. One is compelled to consider failures in the study rather than in the taxonomy to account for the emergence of less -than-clear support by the data. What comes out of a

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* Correlations using pooled secretarial and technician data are not presented because they add little to what has already been shown. Moreover, since the competence measures for secretaries and technicians were different, combined analyses can only deal with the aptitudes and overall competency rating.

factor analysis is ultimately a function of what you put in. We put a battery of aptitude tests which we had pre-selected to fit the four domains of the taxonomy. This pre-selection was based largely on face considerations, i.e., what each test seemed to be measuring. The factor analysis indicated, for instance, that the ship destination test which we took for a measure of the cognitive function-processing, was actually measuring a more perceptual function while the pencil maze also functioned more as a measure of perception than as a measure of psychomotor skills. Other measures were found to appear on two factors (e.g., creating). What is encouraging is that four major factors appeared which seemed close to those in the taxonomy.

On the secretarial competence battery, three major factors appeared and two minor ones. Again, some reasonable correspondence to the taxonomy appeared. The other two factor analyses were the least supportive. However, the data going into each analysis had the least range in terms of its possibility for supporting the taxonomy.

Overall, we must conclude that some (although not complete) support for the taxonomy was obtained. The strong face validity that the taxonomy possesses leads one to recommend other studies to additionally validate the taxonomy.

2. Are the Competency Measures Valid?

The major basis by which the validity of the competency measures can be assessed is by comparing them to the competency ratings. In the secretarial competency battery, three of the seven tests have dubious validity. These are proofreading, filing, and secretarial problems. None of these three tests correlate with any of the ratings. The remaining four secretarial competence tests correlate with between two and eight of the ratings, particularly with those ratings closest in meaning to the activity measured by the test. Thus, four of the seven measures could be used for evaluating the performance of secretaries with some confidence in the validity of these measures.

All of the written technician tests correlate with the overall competence rating. Moreover, these written tests all appear on the same factor. Both findings indicate that these written tests measure the same thing, that being, moreover, what the course instructors consider to be competency. The first and last performance tests are different from the five in the middle. The first and last show no relation to overall competency and do not

2

factor with the other performance tests on the same factor. In general, one would argue that these tests are valid but that the first and last performance tests are different, either for reasons of content, or for being first and last.

3. Do the Aptitude Tests Predict Competency?

The answer to this question has got to be "no!" No pattern of relationships exists between the aptitude battery and either the competency battery nor between the aptitude battery and the secretary supervisor ratings. In examining the secretarial competency battery, some individual correlations to aptitude tests stand out, but these are in the minority. Of the 126 correlations between aptitudes and secretarial competencies, only 4 achieve significance at the .05 level while an additional 7 achieve significance at the .10 level. More than 91% of these correlations were below .29. The fact that the secretarial sample was small (N = 38) and that more than half of the Ss had only completed one year of secretarial training rather than two may account for some of the variance. However, it would also seem reasonable to conclude that the paper-and-pencil aptitude tests are not exceptionally good predictors of performance. It must also be noted that the aptitude battery was long and tiring (18 tests); each test when given alone may be more valid than 18 of them given together. Moreover, the aptitude tests were shortened for time-saving purposes, thus lessening their reliability.

The aptitude tests do only slightly better in predicting the secretary supervisor ratings. Of the 252 correlations, 25 (about 10%) achieve the .05 level while an additional 15 achieve the .10 level. Together, about 16% reach or exceed .29. Moreover, half (9) of the aptitude tests show no correlation of .29 or higher with any of the ratings. Of the remaining nine, those that seem most related to the 14 ratings are:

(1) recognizing (6 correlations)
(2) creating (12 correlations)
(3) integrating (6 correlations)
(4) habituating (6 correlations)

Note that each of the above nominally represents a different domain and that each is the most complex (i.e., advanced) in that domain. Thus, the aptitude tests are of some value in predicting secretarial competence based on ratings, particular the four listed above.

The aptitude tests fail to predict technician competence as they failed to predict secretarial competence. Of the 252

correlations, 19 achieved the .05 level and five the .10 level. Together, then, fewer than 10% of the correlations reached or exceeded .29. Again, patterns were conspicuous by their absence. Only five aptitude tests had as many as two significant or near-significant correlations with the 13 tests in the technician battery. Two of these five tests had negative correlations with technician competence, making their value minimal.

Thus, we cannot recommend that the aptitude battery be used as a basis for selecting or identifying competent secretaries or technicians. It may be that a shorter, simpler battery might be developed for this purpose.

4. The Demographic Variables

In many analyses, age, high school curriculum, and level of education appear as variables. Among the secretaries, level of education distinguishes between the 14 second year secretarial students and the 24 first year secretarial students. Age and level of education correlate at .59 meaning that the second year students are generally older than the first year students. High school curriculum refers to college prep, commercial/vocational, and general curriculums. (High school curriculum data was not entered for the technicians.)

The three demographic variables show no clear pattern of relationships to either competency battery but do relate systematically to the secretary supervisor ratings. Older girls and second year girls (the same girls in most instances) were more highly rated on most of the scales. Moreover, girls with a commercial/vocational high school major were more highly rated on most measures than college prep majors. These findings are consistent with one's expectations.

5. Conclusions

The following are the major conclusions of this study:

(1) The taxonomy not only has face validity but is somewhat substantiated by factor analyses of aptitudes, secretarial competencies (both measured and rated), and technician competencies.
(2) Both secretarial and technician competency batteries were validated by a comparison with supervisor ratings of competency.
(3) The aptitude battery is of essentially no use in predicting measured competency among secretaries and tech-

nicians (although a few of the tests are helpful in predicting the rated competency of secretaries).

6. Recommendations

(1) The taxonomy should be used and tested with competencies in other areas. It may be possible to use this as a basis for occupational clustering.

(2) The taxonomy should be used as the basis for writing and organizing curriculum materials (as was originally the intention of the SCOPE Project).

(3) The aptitude test concept as a predictive approach should be superseded by the performance test as a diagnostic approach.

(4) Competency test measurement and means for validating such tests should be expanded.

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APPENDIX I-A

BLOOM TAXONOMY
(a condensed version)

1.00 KNOWLEDGE

- 1.10 Knowledge of Specifics
  - 1.11 Knowledge of Terminology
  - 1.12 Knowledge of Specific Facts
- 1.20 Knowledge of Ways and Means of Dealing with Specifics
  - 1.21 Knowledge of Conventions
  - 1.22 Knowledge of Trends and Sequences
  - 1.23 Knowledge of Classifications and Categories
  - 1.24 Knowledge of Criteria
  - 1.25 Knowledge of Methodology
- 1.30 Knowledge of the Universals and Abstractions in a Field
  - 1.31 Knowledge of Principles and Generalizations
  - 1.32 Knowledge of Theories and Structures

2.00 COMPREHENSION

- 2.10 Translation
- 2.20 Interpretation
- 2.30 Extrapolation

3.00 APPLICATION

4.00 ANALYSIS

- 4.10 Analysis of Elements
- 4.20 Analysis of Relationships
- 4.30 Analysis of Organizational Principles

5.00 SYNTHESIS

- 5.10 Production of a Unique Communication
- 5.20 Production of a Plan, or Proposed Set of Operations
- 5.30 Derivation of a Set of Abstract Relations

6.00 EVALUATION

- 6.10 Judgments in Terms of Internal Evidence
- 6.20 Judgments in Terms of External Criteria

KRATHWOHL TAXONOMY
(a condensed version)

1.0 RECEIVING (ATTENDING)

- 1.1 Awareness
- 1.2 Willingness to Receive
- 1.3 Controlled or Selected Attention

2.0 RESPONDING

- 2.1 Acquiescence in Responding
- 2.2 Willingness to Respond
- 2.3 Satisfaction in Response

3.0 VALUING

- 3.1 Acceptance of a Value
- 3.2 Preference for a Value
- 3.3 Commitment

4.0 ORGANIZATION

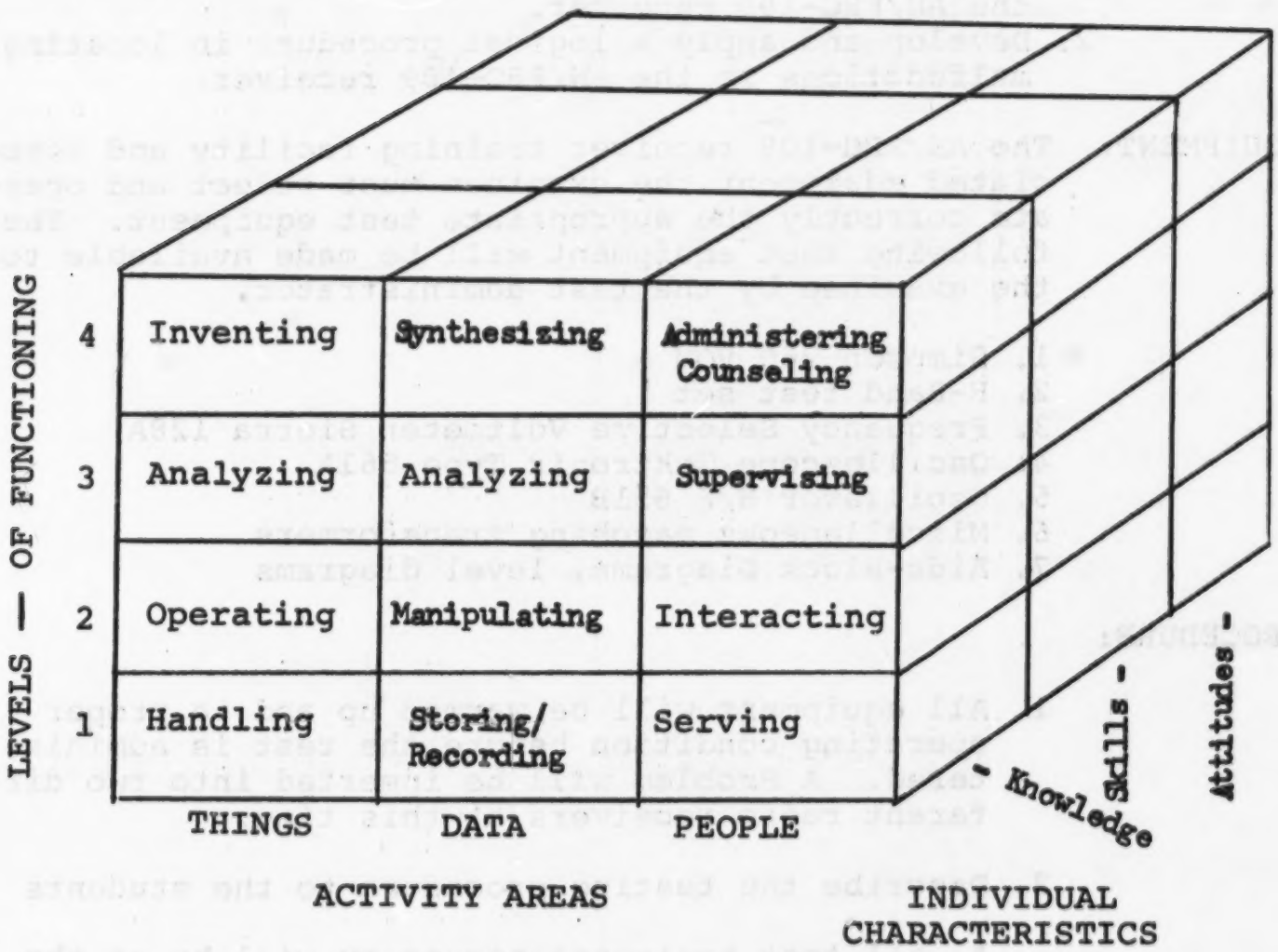
- 4.1 Conceptualization of a Value
- 4.2 Organization of a Value System

5.0 CHARACTERIZATION BY A VALUE OR VALUE COMPLEX

- 5.1 Generalized Set
- 5.2 Characterization

THREE DIMENSIONAL REPRESENTATION OF TAXONOMY

(After Yagi, K. et al. The design and evaluation of vocational technical education curricula through functional job analysis. Project #6-1659, Grant No. OEG-2-6-061-659-2085. George Washington University, August 1968.)



APPENDIX I-B

STRATEGIC MICROWAVE REPAIR COURSE (MOS 26V2)

PHASE VIII - (WK-14)

ADMINISTRATORS INSTRUCTION SHEET

PURPOSE: To measure the students ability to:

1. Select and operate test equipment associated with the AN/FRC-109 receiver.
2. Develop and apply a logical procedure in locating malfunctions in the AN/FRC-109 receiver.

EQUIPMENT: The AN/FRC-109 receiver training facility and associated equipment the examinee must select and operate correctly the appropriate test equipment. The following test equipment will be made available to the examinee by the test administrator.

1. Simpson 260 VOM
2. H-Band test set
3. Frequency Selective Voltmeter Sierra 128A
4. Oscilloscope Tektronix Type 561A
5. Oscillator H/P 651B
6. Miscellaneous matching transformers
7. Aids-Block Diagrams, level diagrams

PROCEDURE:

1. All equipment will be warmed up and in proper operating condition before the test is administered. A Problem will be inserted into two different radio receivers at this time.

2. Describe the testing procedure to the students

   A. All test equipment necessary will be at the test position. You will be required to select and then calibrate the proper test equipment to be used.

   B. There will be one fault in each of two receiver racks. You will be required to locate the fault

in each rank using the correct troubleshooting procedure.

C. The time limit for each problem is 6 minutes.

D. You will be graded on the following items

(1) Selection, calibration, and application of test equipment
(2) Procedure used in locating the faults
(3) Localization of the faults

E. If you have any questions, ask them before you begin one problem: talking will not be permitted during the test.

SCORING:

A. The test administrator will assign scores in accordance with the following:

1. Completing correctly problem 1	5 points
2. Completing correctly problem 2	5 points
3. Selection and use of test equipment	5 points
4. Troubleshooting procedure	5 points
TOTAL POINTS	20

B. The administrator will circle the points obtained in all sections of the problem.

C. The total points obtained will be found by adding up the circled values in all sections of the test.

D. The administrator will transfer the total points obtained onto the ADP answer card. Remember an A indicates zero points and a B indicates one point.

Part II Forging an Effective Communication Link Among State-Supported Curriculum Laboratories in Vocational Education

INTRODUCTION

The forces of change that engulf modern man and threaten to sweep away all of his social anchors are nowhere as prevalent and observable as they are in the area of education. The daily, almost monotonous attacks on our schools by students and parents alike are so intense that at times they seem capable of obliterating formal education as it presently exists.

Fortunately, many educators have come to realize that change is as inherent in education as it is in other aspects of society, and when properly managed it can be a beneficial and constructive force. Therefore, wishing to control innovation such that it is based on sound, scientific principles including preparatory research and continuous evaluation, many states have created curriculum development laboratories. These centers, which are usually affiliated with a university, are responsibile for providing the local school systems with curriculum materials that are the results of careful research and preparation by educational and lay "experts." These materials seek to adapt the best thinking available to the needs of their particular geographical region.

Some fifteen to twenty states have established curriculum development laboratories that specialize in the vocational areas. While producing much quality material, it is quite obvious that these laboratories are beset with a number of problems, not the least of which is a duplication of materials. The fundamental cause of most of these problems, especially that of duplication, is the lack of communication among the laboratories. Attempts have been made in the past to bring these laboratories into closer harmony, but apparently with little or no success.

But the time seemed ripe in 1968, however, to try once again to bring about a closer alliance among the laboratories. An idea was conceived within the Department of Vocational-Technical Education at Rutgers to approach the U.S. Office of Education with a request for funds to create an agency at Rutgers which would have such a task as one of its major objectives. The idea was warmly received in Washington, and thus, SCOPE was born on June 23, 1968.

As outlined in the grant, SCOPE was to act as an independent, catalytic agent in the establishment of a functional communication link among the state-supported vocational curriculum development centers. The directors of these centers would be brought together on several occasions to discuss their common problems, to plan for more effective dialogue, and perhaps even to establish some formal organization among themselves. Once established, they would assume the responsibility of maintaining whatever ties were formed. With its task completed, SCOPE would then turn to other responsibilities.

In addition to visitations to several of the laboratories and a steady stream of mailings, two conferences at Rutgers in the Spring of 1969 were utilized as a means by which to bring the laboratory directors together. The first conference would involve laboratory directors, several consultants from the Department of Vocational-Technical Education at Rutgers, and the SCOPE staff. The two-day meeting would concentrate on identifying common problems among the laboratories, and on discussing the mechanisms for better communication.

The second conference would serve two primary purposes: (1) to continue the exploration of possiblities for evolving a formal organization among the curriculum laboratory people, and (2) exposing the directors to recent developments in curriculum innovation and technological development. A number of prominent educators would make presentations on a variety of topics, ranging from the writing of behavioral objectives to evaluating large-scale programs. The presentations would then be published and disseminated widdly by SCOPE. As a service to the University and surrounding area, the conference would be open to the public.

What follows below is an attempt to illuminate the major highlights of each activity.

METHODS

1. Initial Contact With State Directors and Curriculum Lab Directors

The first task was to identify the operating State-supported curriculum labs in vocational education. A cur-

riculum lab was defined as a State-supported physical facility engaged in the development and production of curriculum materials (guides, lesson plans, textbooks, resource material, audio-visuals) in at least one vocational education service area.

The following initial contact-activities were undertaken.

a. Letters to State Directors of Vocational Education

Each State Director of Vocational Education was sent a letter from SCOPE outlining its purpose and plans along with a memo from David S. Bushnell, Director- Division of Comprehensive and Vocational Education Research, USOE, DHEW and Leon P. Minear, Director- Division of Vocational and Technical Education, USOE, DHEW requesting their cooperation with SCOPE. (A copy of each document appears in Appendix II-A.) Based on the responses of State Directors and contact with the field, 19 labs were identified.*

b. Letters to Curriculum Lab Directors

Each Curriculum Lab Director was sent a letter from SCOPE outlining its purposes and plans and a questionnaire about the activity and characteristics of the lab. (These appear in Appendix II-A.) Each was asked to complete and return the questionnaire.

c. Informal Contacts With Lab Directors

The informal contacts took two forms. The first was visitations to some of the labs. The second was informal meetings with lab directors at the AVA Convention in Dallas, 1968.

During the week of November 12, 1968 Dr. Tuckman and Mr. Casello flew to the State-supported curriculum laboratories at Raleigh, North Carolina, Clemson, South Carolina, and Murfreesboro, Tennessee. In addition to being the recipients of generous southern hospitality, Dr. Tuckman and Mr. Casello were afforded an opportunity to meet with the director and staff of each lab to present the SCOPE Project and its objectives in great detail, to gain some awareness of the philosophies and problems of each director, and to begin to identify the issues for inclusion in the format for the spring conferences at Rutgers University for the laboratory directors. A

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* New York and Washington were added to the original list of 17.

tour was made of the facilities at each laboratory, as well as the communities in which they are located. Visits were also made to Duke University, North Carolina State University, Clemson University, Middle Tennessee State University, and the W.W. Holding Technical Institute, where there was a thorough exposure to the vocational-technical program offered at this community college.

The trip to the three southern curriculum laboratories was most beneficial in that it gave SCOPE staff members an opportunity to meet three of the lab directors personally, to evaluate their reactions to our efforts to help form some confederation among them, and to prepare for the spring conferences. It became quite apparent, for example, that the following items must be discussed at length in a meeting of the lab directors:

(1) the advantages that would accrue from some sort of communication network on their part

(2) the mechanics of such a union

(3) the possibility of a common repository to serve as a printing and distribution center

(4) the possibility of expanding the original planning group to include other existing laboratories

(5) the different administrative organizations and formats that exist among the laboratories

During the week of December 9, 1968 Dr. Tuckman and Mr. Casello attended the AVA Convention in Dallas, Texas. The trip proved to be an excellent opportunity for disseminating information on the SCOPE Project and gathering data regarding progress in the field of vocational-technical education. Mr. Casello met with members of the AVA Agricultural Division Professional Information Committee and discussed SCOPE and curriculum laboratories in general.

The trip to Dallas also afforded the SCOPE staff an opportunity to develop further the communication network among the curriculum lab directors. A meeting was held at the SCOPE suite for all of the lab directors in attendance. A dozen directors came together, established personal contact, conferred concerning their common policies and problems, discussed the

possibility of a union, and offered suggestions for the organization of the spring conferences at Rutgers University. A solid foundation was laid for the spring conferences and the confederation of curriculum laboratories. Moreover, the SCOPE personnel gained some insight into the problems common to all of the laboratories and the issues which must be resolved before a viable communication network can become operative among them.

d. Presentation to State Directors and Others

At the AVA meetings in Dallas, 1968, Dr. Byrl Shoemaker, State Director of Vocational Education in Ohio, presented the ideas and plans of SCOPE to the assembled state directors at their annual meeting. Articles about SCOPE were also published in Feedback, the newsletter of the New Jersey Division of Vocational Education, Occupational R & D branch, and in the Research Bulletin of the New Jersey School Development Council. Moreover, a brochure was prepared and widely circulated.

2. SCOPE Conferences

Two conferences were held in the first half of 1969 for the curriculum lab directors. The first of these was aimed at providing a vehicle for integration and communication among the curriculum labs. At this meeting the following activities occurred:

- Presentation of the purposes and plans of SCOPE.
- Presentation about forces operating in the area of vocational education which are mandates for action in the curriculum development field.
- Opportunity for lab directors to meet one another and describe their labs and lab activities to one another.
- Opportunity for lab directors to describe the administrative arrangements within their State in which their lab operates.
- Opportunity for lab directors to share materials and catalogues.
- Opportunity for lab directors to plan for the development of an organizational base to facilitate further interaction.

The activity mentioned last was a key element of the two-day (three-evening) meeting. (The list of conference participants appears in Appendix II-B.)

The second conference was aimed at presenting information about new concepts and developments in the curriculum field to the lab directors as well as providing them with a second opportunity to meet formally and follow up on plans developed during the first conference.

A number of speakers were brought in to make presentations of theoretical and practical interest. These are described more fully in the results section.

RESULTS

1. Data on the Curriculum Labs

Seventeen States responded to the curriculum lab questionnaire. These responses appear in TABLE II-1. Of the States responding, Georgia and Oregon did not have labs that fit our operational definition; because of this and limitations in our budget, they were not invited to participate in the two conferences. New York and Washington were subsequently added to the list and did participate in the conferences. In all, 12 of the labs participated in the conferences. The remainder did not for reasons of our budget or their willingness or availability. Those participating were Alabama, Illinois, Kentucky, Louisiana, New Jersey, New York, North Carolina, Ohio (Agriculture), South Carolina, Texas (at Texas Tech), Texas (Distributive Education at Austin), and Washington. (Unforeseen circumstances prevented the participation of the directors from the Trade and Industrial Education curriculum labs in Ohio and Texas.) Lab directors from the above 12 States thus formed the backbone for all activity between SCOPE and the labs.

2. First SCOPE Conference - March 27 and 28, 1969

Eleven curriculum laboratory directors, two members of the Department of Vocational-Technical Education at Rutgers University, a representative from the United States Office of Education, and the Director of SCOPE and his administrative assistant were present at this first conference. (See Appendix II-B.)

TABLE II-1 A Summary of State Curriculum Laboratories

	ANNUAL BUDGET	NO. OF EMPLOYEES	SIZE OF FACILITIES (SQ. FEET)	VALUE OF EQUIPMENT
Texas - D.E.	38,000	5	1,134	-
Texas - Ind. & B.E.	240,000	37	4,560	40,000
Texas - Agr.	160,000	24	11,800	24,000
Tennessee	125,000	12	4,500+	125,000
S. Carolina	101,000	11	3,500	62,000
Oregon	24,000	NO LAB	NO LAB	
Ohio - T.&I.	15,000	6	2,800	25,000
Ohio - D.E.	10,000	3	900	20,000
Ohio - Agr.	30,000	6	700	800
N. Carolina	219,000	19	4,000	50,000
New Jersey	40,000	6	1,300	20,000
Missouri	20,000	12	2,600	7,000
Louisiana	100,000	10	8,500	75,000
Kentucky	14,000	11	-	-
Illinois	175,000	31	28,000	-
Georgia	13,500	2	-	-
Alabama	18,000+	4	3,220	40,000

TABLE II-1 Continued

AREAS OF SPECIALIZATION		Agr.	T. & I.	Bus. & Off.	D.E.	Home Ec.	Health	Technical	Vocational Guid.
Texas - D.E.					X				
Texas - Ind. & B.E.			X						
Texas - Agr.		X							
Tennessee		X	X	X	X	X	X	X	
S. Carolina		X	X	X	X	X	X		X
Oregon		X	X	X	X	X	X		
Ohio - T.&I.			X						
Ohio - D.E.					X				
Ohio - Agr.		X							
N. Carolina		X	X	X	X	X	X	X	
New Jersey		X	X	X	X	X	X	X	X
Missouri		X	X	X	X	X	X	X	
Louisiana		X	X	X	X	X	X	X	X
Kentucky		X	X	X	X	X	X		
Illinois		X							
Georgia			X						
Alabama			X		X		X	X	

TABLE II-1 Continued

	PUBLICATIONS ON FILE	PUBLICATIONS PER YEAR	ANNUAL GROSS RECEIPTS	PUBLICATIONS AVAILABLE TO OTHER STATES
Texas - D.E.	120	13	-	Yes
Texas - Ind. & B.E.	116	-	-	Yes
Texas - Agr.	50	20	15,000	Yes
Tennessee	None	104	None	Yes
S. Carolina	50	50	8,000	Special Printing
Oregon	-	-	-	-
Ohio - T.&I.	250	5	175,000	Yes
Ohio - D.E.	30	6-8	6,000	Yes
Ohio - Agr.	60	5	25,000	Yes
N. Carolina	1,800	50	None	Single copies
New Jersey	175	15-20	17,000	Yes
Missouri	24,000	25,000	21,000	Yes
Louisiana	50	15	4,000	Yes
Kentucky	-	-	-	No
Illinois	350	25	70,000	Yes
Georgia	52	23	Free	Single copies
Alabama	18,638	19,500	-	Yes

At the opening of this conference, Dr. Tuckman presented the background, purposes, and plans of SCOPE. He also made a presentation concerning the influences on curriculum development in vocational education. (The outline of this presentation appears in TABLE II-2.) The purpose behind this talk was to establish a climate for communication and organization among curriculum lab directors.

The remainder of the time at this conference was spent examining problems and issues common to the labs and focusing on the development of an organization for continuing interaction.

A stimulating and open discussion among the participants led to the identification of many common problems, among which were:

1. duplication of effort among the laboratories
2. the need for greater distribution of materials
3. better communication and standardization of techniques among the laboratories
4. identification of curriculum development persons
5. the development of a meaningful relationship between the laboratories and teacher training institutes
6. management and organizational practices relative to the laboratories
7. classification of materials
8. problems relative to staffing, facilities, hardware, and money
9. a strategy for organization among the laboratories

It is worthy to note that much concern was expressed by the directors regarding the need for curriculum development specialists to have more visibility at the state and national levels. There was unanimous agreement among the conferees that curriculum people are in dire need of an executive or steering committee on an interstate or national level that can serve to unite curriculum personnel and act in the capacity of spokesman for them.

This line of thinking seemed to lead quite naturally to an exploration of possible mechanisms for creating some type of confederation among the curriculum centers represented. Initial dialogue focused on improved communications, which led to a decision to begin conducting periodic meetings for laboratory directors. Hopefully, a newsletter-type publication would be published to supplement the periodic meetings and to update all on curriculum materials being developed at each laboratory. To facilitate these objectives, the laboratory directors present decided unanimously to designate themselves as an ad hoc committee:

TABLE II-2

Influences on Curriculum in Vocational Education

(1) emerging occupations (new careers)

new technology, automation

(2) proliferation of vocational education

into J. H. S. guidance
comp. high school
two-year college
manpower and adult
even technology for children

(3) development of media and hardware

movie camera
t. v.
simulation
tech. resources center

(4) development of curriculum theory

cluster concept
behavioral objectives
Richmond Plan

(5) concern with youth with special needs

handicapped
disadvantaged

(6) emphasis on learning by doing

vocationalizing the academic

* * *

Values Behind A Coordinated Effort

(1) efficiency
(2) cost
(3) mobility limits the appropriateness of building curricula for local needs
(4) integrating across subject matter
(5) coordination of local talent and resources

This group constitutes itself as a committee on Vocational Instructional Materials for the purpose of increasing the visibility of instructional and material development activities and providing the opportunity for interchange among persons so involved.

The purposes of VIM were identified as being:

- To encourage and facilitate the interchange of information among curriculum developers
- To encourage cooperation among curriculum personnel
- To stimulate professional development and visibility in this field
- To help shape and implement state and National policy
- To create a climate conducive to curriculum development
- To encourage the development of qualifications for curriculum personnel
- To identify personnel with curriculum responsibility
- To identify common problems among curriculum laboratory directors
- To publicize noteworthy materials and programs in this area

The American Vocational Association was chosen as the vehicle by which VIM could best accomplish its objectives at this time. Agreement was reached to approach the AVA through its "New and Related Services" Branch in request of a block of time on the program at the National Convention in Boston this coming December. Such a program would be used to recruit members for a national organization of curriculum developers. A steering committee consisting of Arthur Jensen, G. Earl Hay, and John Matthews was elected and charged with the responsibility of approaching the AVA to arrange for the program. A report would be heard at the second conference.

3. Second SCOPE Conference - May 1 and 2, 1969 (See Appendix II-B.)

Twelve curriculum laboratory directors were able to join

members of the Department of Vocational-Technical Education and the SCOPE staff at Rutgers for the second conference. As stated previously in this report, the main purpose of this two-day meeting was to expose the laboratory directors to the most recent educational theory and technological innovation being developed throughout the Nation. It was felt that those who work in the preparation of instructional materials would profit greatly from exposure to the results of research and innovative thought as represented by the people presenting the papers. The directors later expressed complete agreement with this thinking, and proved to be most receptive to the presentations.

The format of the program consisted of an attempt to supplement the presentation of theoretical concepts with exemplary programs that are presently in existence and appear to be realistic and successful approaches to present needs. To this end, the program included the following speakers and their topics:

Theoretical

- The Preparation and Use of Behavioral Objectives
  Dr. Edward Morrison, Ohio State University

- Individually Prescribed Instruction: A Program and Its Evaluation
  Dr. C. Mauritz Lindvall, University of Pittsburgh

- Techniques for Large Scale Curriculum Evaluation
  Dr. Henry H. Walbesser, University of Maryland

- The Cluster Concept Program as an Approach to Vocational Education
  Dr. Donald Maley, University of Maryland

Operational Programs

- A Coordinated Industrial Preparation Program
  Mr. Irving Moskowitz, Hackensack, New Jersey

- The Technology for Children Program
  Dr. Fred Dreves, New Jersey State Department of Education

- The Single Concept Film Loop
  Mr. Cy Sommers, Rutgers University

- Successful Use of Audio-Visual Materials
  Mr. Ed Dawson, Somerset County Media Center

In addition to the curriculum laboratory directors, the conference was attended by faculty and students from the Graduate School of Education at Rutgers, officials from the New Jersey State Department of Education, and representatives from local high schools.

At the VIM Business Meeting following the formal program, Dr. Jensen reported to the group that the American Vocational Association was most receptive to his requests for time on the program in December. The problems now to be resolved were:

1. How much time to request on the Convention program,
2. the most opportune time to attract participants,
3. what type of program to have, and
4. the nature of publicity concerning the program.

A tentative decision was reached to develop a program of five to six hours in length which would be divided into two sessions, each of which would be held on a different day. The first session would be used to attract an audience by presenting speakers on topics relative to curriculum development. The second session would be utilized for organizational purposes, with hopefully those who attended the first session being drawn back for a second time. The steering committee would work closely with representatives of AVA in determining the most feasible time for holding the two sessions.

The session closed with a discussion of pre-convention publicity. No final decision was reached, but each director accepted the responsibility of identifying curriculum development personnel in his state. ERIC was also to be contacted as a possible source of such people.

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* The proceedings of this conference were published by SCOPE as an additional USOE report and are available.

4. Follow-Up

At this point, SCOPE officially bowed out and left the organization developed by the lab directors (VIM) as a result of the two SCOPE conferences to its own devices. However, we continued to monitor their activities. SCOPE personnel participated in the 1969 AVA meetings in Boston and continued to interact with the lab directors. VIM was successful in its plan to seek time on the AVA program and to relate itself to the Division of New and Related Services of AVA. (This plan was developed during the SCOPE conferences.) VIM used its time on the program to hold a business, dissemination, and recruitment meeting as well as using some time for a substantive program featuring some persons who had served as presenters for the second SCOPE conference.

Thus, the Vocational Instructional Materials (VIM) organization, a group made up of curriculum people in vocational education was launched!

CONCLUSIONS

SCOPE set out, as one of its principal objectives, to help establish a viable communication link among State-supported curriculum laboratories. A number of national and regional attempts to accomplish this had failed in the past. SCOPE succeeded in attaining this objective through the creation of the Vocational Instructional Materials (VIM) group, now affiliated with the American Vocational Association.

Critical factors that may have contributed to this outcome were:

(1) fortuitously good timing — curriculum laboratory people may have simply been ready to come together;
(2) the emergence of curriculum as a national concern in vocational education — the Vocational Education Act of 1963 and Amendments of 1968 have raised curriculum development to a position of national concern;
(3) the opportunity to meet and interact as a "total" group — getting away from their desks and together on a face-to-face basis would seem necessary for the identification of common interests;
(4) stimulation by SCOPE activities — the SCOPE approach was to help the lab directors identify their own roles and those of their field in vocational education;

(5) well-meaningness and leadership within the ranks of lab directors -- participants in the SCOPE conferences came to work together and leadership emerged from their ranks;
(6) sponsers' emphasis on the goal of uniting -- this goal was highlighted by USOE support of SCOPE and SCOPE's support of the lab directors; SCOPE helped the lab directors perceive the creation of an organization as a valuable asset to their field;
(7) perceived communalities -- certainly the labs had much in common, a fact they became aware of upon coming together;
(8) the perceived liabilities of failure to communicate versus the assets incumbent upon communication -- these were brought out at the conferences.

SCOPE has retained communication with lab directors via the SCOPE mailing list. We served as the vehicle for communication. The lab directers took over from there.

APPENDIX II-A

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Office of Education
Washington, D.C. 20202

MEMORANDUM **September 27, 1968**

Sent to: State Directors of Vocational Education

Sent by: David S. Bushnell, Director
Division of Comprehensive and
Vocational Education Research

Leon P. Minear, Director
Division of Vocational and
Technical Education

Subject: Initiation of the SCOPE Project at Rutgers University (U.S.O.E. Project No. 8-0334).

The SCOPE Project (Study of Curriculums for Occupational Preparation thru Education), which the United States Office of Education is pleased to sponsor, is now operative at Rutgers University. Among its functions will be the important task of helping to establish a viable communications link among the many State-supported Curriculum Development Laboratories. This is an important objective, for it will enable the Curriculum Labs to become an even more potent force in meeting tomorrow's educational needs.

We attach great importance to SCOPE because we anticipate that the field of vocational-technical education will profit from coordination and cooperation among the States in the important domain of curriculum development. It is our hope that you, as the Directors of Vocational and Technical Education and persons having the responsibility for vocational curriculum development in your States, will afford Dr. Bruce Tuckman and his SCOPE staff your fullest cooperation. In doing so, you will be furthering our joint efforts and programs in the national cause of vocational curriculum development.

RUTGERS · THE STATE UNIVERSITY

NEW BRUNSWICK, NEW JERSEY 08903

SCOPE Center
Douglass-WoodLawn Gatehouse
(201) 846-4628

September 27, 1968

Dear State Director of Vocational Education:

The SCOPE Center (Study of Curriculums for Occupational Preparation and Education) is now operative. With your approval, along with that of the other State Directors of Vocational-Technical Education, we would like to use our Center and the Federal funds at our disposal to help the State-supported Curriculum Development Laboratories establish a viable communications link among themselves. The Federal Government has authorized funds for this endeavor because it believes that these Laboratories can become an even more potent national resource if the proper catalyst for interlocking were provided. We feel, as I am sure you do, that the entire field of vocational-technical education would benefit from such intensified interaction.

We would also like to use our resources to get the Curriculum Labs to conceive of and pursue a national role in curriculum development. There is an urgent need to increase the relevance of high school education for the large majority of our youth who must seek employment or further job training upon graduation. Tied to this necessity is that of extending vocational offerings to more students, particularly those in comprehensive high schools. To accomplish such objectives would require not only a proliferation of vocational curriculums, but the breaking of new ground in vocational curriculum development. Collectively, the Curriculum Labs have the means to be a strong and recognizable influence in such a movement. We would like to cooperate and be a part of that challenge with them. The

time for a vocational curriculum thrust in American education is now. Together we can do much to implement that thrust.

Our schedule calls for a visitation by SCOPE personnel of as many of the Curriculums Labs as time and funds will allow. These visitations will be followed by two conferences at Rutgers University early next spring, their purpose being to allow the various Lab Directors to get acquainted, discuss the possibility of a communications network, and converse with other specialists about the latest advances in curriculum theory and educational technology. If you do not object, we would like to carry on direct correspondence with the Curriculum Lab Directors. In addition, we would appreciate it if you would notify the Curriculum Lab Director of your endorsement of this Project, and urge them to attend our spring conferences.

In closing, let me express my sincere appreciation for your cooperation. Also, please accept my invitation to join us at the spring conferences, and at our suite in the Statler-Hilton Hotel during the AVA Convention. I look forward to meeting with you in the near future.

Cordially,

Dr. Bruce W. Tuckman
Director

Mr. Joseph H. Casello
Assistant to the Director

BWT/JHC/sjo'b

enclosure

RUTGERS · THE STATE UNIVERSITY

NEW BRUNSWICK, NEW JERSEY 08903
SCOPE Center
Douglass-WoodLawn Gatehouse
(201) 846-4628

September 27, 1968

Dear Curriculum Lab Director:

The SCOPE Center (Study of Curriculums for Occupational Preparation and Education) is now operative. Our initial focus is on helping you and the other Directors of the State-supported Curriculum Development Labs establish a viable communications link among yourselves. The Federal Government has authorized funds for such an effort because it realizes that these laboratories can become an even more potent national resource if the proper catalyst for interlocking were provided. We feel, as I am sure you and your fellow Directors do, that not only would the Curriculum Centers profit from such interaction, but the entire field of vocational-technical education as well would gain from such a combined thrust. Our contribution to developing tomorrow's education would be that much greater.

To implement our effort at helping you to coordinate, two conferences are being planned for Rutgers University during the early spring of 1969. The initial conference will provide you with an opportunity to meet with the other lab Directors and establish some form of network if it is your desire to do so. The second meeting will enable you to converse with educational leaders from a variety of specialties about the latest advances in curriculum theory and educational technology and their implications for vocational education. Hopefully, you and the other Directors will be in attendance on both occasions. The SCOPE Project will provide funds for your travel and lodging costs, as well as providing you with a stipend for each conference.

My assistant and I will attend the AVA Conference in Dallas during the first week in December. We hope many of you will visit with us in our accommodations at the Statler-Hilton Hotel so that we can get to know each other on a personal basis. We

would also like to visit as many of the Curriculum Laboratories as time and funds allow (which unfortunately will not be all of them). Each center that we can visit will be contacted shortly to make specific arrangements for such visits. In the meantime, we would appreciate receiving any brochures, pamphlets, etc., that you feel would be informative and useful to us in describing the mission and activities of your Center.

SCOPE's ultimate aim is to assist in increasing the relevance of high school education for the large majority of our youth who must seek employment or further job training upon graduation, a lofty but attainable goal. We, as you, realize that vocational education has achieved some noteworthy success in pursuing this goal for half a century. The present effort in vocational education, with which we would like to identify, is to extend vocational offerings to more students, particularly those in comprehensive high schools. We feel that all students should have some exposure to the world of work, if for no other reasons than to help them learn their "academic" subjects and be able to apply them. This would require not only a proliferation of vocational curriculums, but the breaking of new ground in vocational curriculum development.

We would like to use our Center and the Federal funds at our disposal to help you conceive of and pursue a national role. Collectively you have the means to be a strong and recognizable influence on the national scene. We would like to cooperate and be a part of this challenge with you.

I look forward to meeting you and discussing our common interests and the role we might play in your coordinated activities. I am particularly interested in understanding and appreciating your feelings and ideas concerning the notion of a network of the Curriculum Labs. The time for a vocational curriculum thrust in American education is now. Together we can do much to implement that thrust.

Please write back and give me your reaction to our plans. I hope to see you soon.

Cordially,

Dr. Bruce W. Tuckman
Director

Mr. Joseph H. Casello
Assistant to the Director

BWT/JHC/sjo'b
enclosure

Name of Lab_____

QUESTIONNAIRE TO BE COMPLETED BY CURRICULUM LAB DIRECTORS

1. Approximate Annual Budget_____
2. Number of Employees_____
3. Size of Facilities (sq. footage)_____
4. Approximate Capital Value of Equipment_____
5. Brief Description of Machinery_____

_____

_____

_____

_____

6. Areas of Specialization (check those appropriate)

Agri.	
T & I	
Business & Office	
Distributive Education	
Home Economics	
Health	
Technical	
Vocational Guidance	

Others_____

_____

_____

_____

_____

_____

7. Approximate number of publications on file_____
8. Approximate number of publications per year_____
9. Annual gross receipts from annual sale of literature_____
10. Are publications available to out of state parties?_____

APPENDIX II-B

PARTICIPANTS IN FIRST SCOPE CONFERENCE

Laboratory Directors

Mrs. Pauline Burbrink
Instructional Materials
Laboratory
The University of Texas
at Austin

Miss Barbara Clawson
Instructional Materials Center
Texas Tech University

Mr. G. Earl Hay
N.Y. State Education
Department - Albany

Mr. Roger Worthington
Department of Community Colleges
Division of Occupational
Education - North Carolina

Mr. Benjamin Shapiro
Department of Vocational-
Technical Education
Rutgers University

Mr. Walter Brown
Department of Vocational-
Technical Education
Rutgers University

Dr. J.W. Matthews
Vocational Agriculture Service
University of Illinois

Dr. Arthur K. Jensen
Vocational Education Media
Center - Clemson University
South Carolina

Mr. W.C. Mayfield
Vocational Curriculum Development
and Research Center
Natchitoches, Louisiana

Dr. George Luster
Instructional Materials Laboratory
for Vocational Education
University of Kentucky
Lexington

Mr. C.A. Bradley
Seattle Community College
Seattle, Washington

Dr. Harlan Ridenour
Curriculum Materials Service
The Ohio State University
Columbus

Department of Vocational-Technical Education, Rutgers University

Dr. Carl J. Schaefer, Chairman
Dr. Gordon Law, Associate Professor

U.S. Office of Education

Dr. Robert Pruitt, Deputy Director
Division of Comprehensive and
Vocational Education Research

SCOPE

Dr. Bruce W. Tuckman, Director
Mr. Joseph H. Casello, Assistant to
the Director

PARTICIPANTS IN SECOND SCOPE CONFERENCE

Laboratory Directors

Mrs. Pauline Burbrink
Instructional Materials
Laboratory
The University of Texas
at Austin

Miss Barbara Clawson
Instructional Materials Center
Texas Tech University

Mr. G. Earl Hay
N.Y. State Education
Department - Albany

Mr. Roger Worthington
Department of Community Colleges
Division of Occupational
Education - North Carolina

Mr. Benjamin Shapiro
Department of Vocational-
Technical Education
Rutgers University

Mr. Walter Brown
Department of Vocational-
Technical Education
Rutgers University

Dr. J.W. Matthews
Vocational Agriculture Service
University of Illinois

Dr. Arthur K. Jensen
Vocational Education Media Center
Clemson University
South Carolina

Mr. W.C. Mayfield
Vocational Curriculum Development
and Research Center
Natchitoches, Louisiana

Dr. George Luster
Instructional Materials Laboratory
for Vocational Education
University of Kentucky
Lexington

Mr. C.A. Bradley
Seattle Community College
Seattle, Washington

Dr. Harlan Ridenour
Curriculum Materials Service
The Ohio State University
Columbus

Mr. J.R. Thomas
Alabama State Department of
Education
University, Alabama

SCOPE

Dr. Bruce W. Tuckman, Director
Mr. Joseph H. Casello, Assistant to
the Director

Part III A Study of Ability-Grouping

INTRODUCTION

The purpose behind the development of an interdisciplinary, individualized model was to provide the schools with an approach to handling the diversity in student ability encountered in the typical student body. The present approach for dealing with diversity is homogeneous ability-grouping, a procedure by which students are assigned to classes with students of like ability as predicted by past performance and performance on standardized tests. It has been claimed by many of the critics of homogeneous ability-grouping that it represents the self-perpetuation of status and the reinforcement of both success and failure. These claims are based on the assumption or inference that grouping (or tracking) locks in students to ability-groups. They become the victims of the self-fulfilling prophecy begun way back when they took their first IQ test.

The purpose of this part of the SCOPE Program was to test these inferences in order to gain a better understanding of the present technique for dealing with student diversity. If SCOPE hoped to design the model for the future, it must take into account the model of the present. This limited attempt focused on some simple indicators of the rigidity of grouping outcomes. Specifically, these were (a) the relationship between grouping assignment in two major subject-matters, (b) the relationship between curriculum assignment and grouping assignment in two major subject-matters, (c) the relationship between IQ tests of different types taken at different times in one's educational career, (d) the relationship between IQ test scores and grouping assignment, and (e) the relationship between attendance (presumably a measure of satisfaction) and grouping assignment. While none of these relationships taken individually is tantamount to a hard case against ability-grouping, the five relationships taken collectively lead one toward the inference that many factors are coming together to insure the perpetuation of grouping assignment. Such inflexibility, and the negative self-image that those locked in at the low end must develop, augur against the maintenance of grouping practices and for their replacement by a more individualized approach. The egregious outcomes of ability-grouping, should such occur, will only be detected inferentially in this limited study.

REVIEW OF LITERATURE

An examination of the literature on ability grouping, homogeneous grouping, "tracking," streaming" etc. was undertaken. All journal articles and books dealing in any way with the above topics from 1950 to the present time were collected and examined. Those articles or books involving experimental data based on a comparison of some sort of ability group with a heterogeneous, random or control group were taken to be especially important. Articles of this sort totalled 18. The number of articles, books, etc. labeled as discursive (containing opinion or description of a certain system in operation, not involving experimental data collected and analyzed by the particular author) was 41.

For each experimental study comparing homogeneous vs. heterogeneous grouping in some way the following variables or factors were isolated: grade level, sample size, sample range and level, type of grouping (manipulated by experimenter or ex post facto), criterion used for grouping students, cut-offs and weighting for these criteria, diversity of homogeneous and heterogeneous groups, dependent measures, and outcomes.

The discursive studies were quickly perused to obtain new ideas for grouping systems and descriptions of some already in existence but were not systematically reviewed and are not reported on here. The 18 studies are summarized in **TABLE** III-1.

A REVIEW OF THE STUDIES GROUPED BY OUTCOME AND STUDENT

I. Studies Finding No Differences Between Homogeneous and Heterogeneous Grouping

a. for all pupils

Bicak's study used the 1960-61 8th grade class at the University of Minnesota High School

TABLE III-1

A SUMMARY OF THE GROUPING STUDIES

AUTHOR: Abramson, David A.	YEAR: 1959
GRADE LEVEL: High School	
STUDENT INFORMATION:	New York City academic high school (high ability)
GENERAL GROUPING SPECIFICATIONS:	Homogeneous versus heterogeneous versus special school (on IQ)
SPECIFIC GROUPING SPECIFICATIONS:	Homogeneous: IQ ≥ 115 and special range = 115-60 Heterogeneous: all IQ levels Study concentrated on high ability students
SUBJECT SPECIFICATIONS:	Student grouping ex post facto (done by schools)
ACHIEVEMENT FINDINGS:	1. grouping has no effect on GPA in 1st year college 2. grouping has no effect on grades in specific courses
OTHER FINDINGS:	1. women achieve more than men

AUTHOR: Baiow, Irving H.	YEAR: 1963
GRADE LEVEL: Elementary School	
STUDENT INFORMATION:	6th grade in four California schools; in first five grades - heterogeneous grouping
GENERAL GROUPING SPECIFICATIONS:	Homogeneous versus heterogeneous versus clustering (high-average versus low-average) on achievement test, IQ, and teacher estimation

Baiow, Irving H. (continued)

SPECIFIC GROUPING SPECIFICATIONS:	Homogeneous on achievement test Cluster on IQ and estimate of emotional stability Heterogeneous - random IQ range: Low: 54-98; Mid: 99-110; High: 111-158
SUBJECT SPECIFICATIONS:	Student grouping ex post facto (done by schools)
ACHIEVEMENT FINDINGS:	1. Cluster group had highest growth in general ability - homogeneous next, then heterogeneous (trend) 2. Growth is inversely proportional to rank in the beginning
OTHER FINDINGS	-

AUTHOR: Bicak, Laddie J. YEAR: 1964

GRADE LEVEL: Junior High School

STUDENT INFORMATION:	University of Minnesota 8th grade (science course)
GENERAL GROUPING SPECIFICATIONS:	Homogeneous versus heterogeneous (on IQ)
SPECIFIC GROUPING SPECIFICATIONS:	Median IQ = 117 in homogeneous population Heterogeneous - random group High homogeneous $\geq$ 117 Low homogeneous $\leq$ 117
SUBJECT SPECIFICATIONS:	Grouping manipulated by experimentor two sections randomly chosen for homogeneous grouping
ACHIEVEMENT FINDINGS:	1. no achievement difference between homogeneous and heterogeneous
OTHER FINDINGS:	1. low homogeneous often discontented with placement 2. low heterogeneous often had to neglect other courses for this science course

AUTHOR: Borg, Walter R.	YEAR: 1965
GRADE LEVEL:	Elementary, Junior High School, and High School
STUDENT INFORMATION:	Two adjacent and comparable high school districts (similar in IQ and SES)
GENERAL GROUPING SPECIFICATIONS:	Heterogeneous(R) versus homogeneous(A) (on California Achievement Test)
SPECIFIC GROUPING SPECIFICATIONS:	Grouping depends on score on California Achievement Test; lowest 20 = low, highest 30 = high, rest = middle
SUBJECT SPECIFICATIONS:	Grouping ex post facto
ACHIEVEMENT FINDINGS:	1. no difference in ability gains in homogeneous or heterogeneous in elementary school; tendency to favor homogeneous for high ability group and heterogeneous for low ability group. 2. Some trend in junior high school and high school
OTHER FINDINGS:	1. Better study habits in heterogeneous (elementary) 2. No effect on social adjustment 3. More pupil problems in heterogeneous group 4. Heterogeneous had more favorable self-concept 5. Homogeneous had less sense of belonging

AUTHOR: Borg, W. and Prpich, T.	YEAR: 1966
GRADE LEVEL:	High School
STUDENT INFORMATION:	10th grade English classes
GENERAL GROUPING SPECIFICATIONS:	Homogeneous (low) versus heterogeneous (on English achievement test and IQ and grade placement)

Borg, W. and Prpich, T. (continued)

SPECIFIC GROUPING SPECIFICATIONS:	70-90 IQ ≤8.2 gr. low homogeneous group and heterogeneous (from same population) - concentrated on low ability students
SUBJECT SPECIFICATIONS:	grouping manipulated (randomly to homogeneous or heterogeneous
ACHIEVEMENT FINDINGS:	1. no difference in English achievement 2. homogeneous did better on STEP in second year
OTHER FINDINGS:	1. homogeneous did better on teacher estimate 2. no difference in study method and attitudes 3. homogeneous participated more and better quality 4. homogeneous had more favorable attitude toward English 5. homogeneous had better self-concept

AUTHOR: Cawelti, Gordon YEAR: 1963

GRADE LEVEL: High School

STUDENT INFORMATION:	42 North Central High School with three ability levels in 9th and 10th grade English and math
GENERAL GROUPING SPECIFICATIONS:	Homogeneous grouping - three levels (on IQ, achievement test, and teacher's marks)
SPECIFIC GROUPING SPECIFICATIONS:	-
SUBJECT SPECIFICATION:	Grouping ex post facto on three ability levels
ACHIEVEMENT FINDINGS:	-

Cawelti, Gordon (continued)

OTHER FINDINGS:	1. mean class size greater for higher group 2. teachers did not feel bad social attitudes resulted 3. 88% principals liked it and felt greater achievement 4. high group teachers better prepared

AUTHOR: Cochran, John R. YEAR: 1961

GRADE LEVEL:	Junior High School
STUDENT INFORMATION:	flexible grouping in Kalamazoo 10% school chosen for experimental group randomly
GENERAL GROUPING SPECIFICATIONS:	Heterogeneous versus flexible grouping (on IQ, achievement test, teacher estimate)
SPECIFIC GROUPING SPECIFICATIONS:	Students in two groups paired on sex, age, 6th grade achievement and intelligence
SUBJECT SPECIFICATIONS:	Grouping manipulated 10% - homogeneous rest - heterogeneous matched groups
ACHIEVEMENT FINDINGS:	1. no significant difference in achievement found
OTHER FINDINGS:	1. 77% teachers were satisfied 2. 71% parents said students interest was greater 3. 65% upward mobility

AUTHOR: Dyson, Ernest YEAR: 1967

GRADE LEVEL:	Junior High School
STUDENT INFORMATION:	Two 7th grade populations equal in age, achievement, IQ, SES, and school - only difference is in grouping method

Dyson, Ernest (continued)

GENERAL GROUPING SPECIFICATIONS:	Homogeneous (244) versus heterogeneous (323) (on IQ, achievement, teacher estimate, and principal)
SPECIFIC GROUPING SPECIFICATIONS:	Students in different grouping methods comparable - number of groups unknown
SUBJECT SPECIFICATIONS:	Grouping ex post facto
ACHIEVEMENT FINDINGS:	-
OTHER FINDINGS:	self concept: 1. no sex difference 2. grouping did not affect self-concept or self-acceptance 3. academic self-concept predictive of school success 4. academic self-concept dependent on assigned group

AUTHOR: Goldberg, Miriam et al. YEAR: 1961

GRADE LEVEL:	Elementary School
STUDENT INFORMATION:	2,219 students from 45 elementary schools
GENERAL GROUPING SPECIFICATIONS:	Homogeneous (on IQ) versus heterogeneous
SPECIFIC GROUPING SPECIFICATIONS:	A = more than 130 B = 120-29 C = 110-19 D = 100-09 E = less than 99
SUBJECT SPECIFICATIONS:	Grouping manipulated - organized to represent all combinations of ability levels

Goldberg, Miriam, et al. (continued)

ACHIEVEMENT FINDINGS:	1. grouping had no effect on achievement 2. value of grouping depends on way it is used; effect is neutral
OTHER FINDINGS:	1. Interest increases with grouping 2. Self-attitude affected by grouping 3. Attitudes towards others and the school not effected 4. Teacher appraisal not effected by grouping

AUTHOR: Howell, Wallace J. YEAR: 1962

GRADE LEVEL: High School (880 students)

STUDENT INFORMATION:	Middle SES; residential suburban community (Penfield - Rochester, N.Y.)
GENERAL GROUPING SPECIFICATIONS:	Homogeneous (high) on IQ, achievement, teacher, counselor estimate, parental permission versus heterogeneous Homogeneous (honors) and heterogeneous (high) comparable in IQ, mean & range
SPECIFIC GROUPING SPECIFICATIONS:	Concentrated on honors (high ability) students
SUBJECT SPECIFICATIONS:	Median IQ = 114 for population 3/4 continued after high school grouping manipulated
ACHIEVEMENT FINDINGS:	1. high homogeneous had more achievement than in heterogeneous
OTHER FINDINGS:	1. grouping did not lead to bad social character 2. grouping did lead to a more realistic view of ability

AUTHOR: Klausmeier, H.J. et al.	YEAR: 1960
GRADE LEVEL: High School	
STUDENT INFORMATION:	Three comprehensive high schools - all used some ability grouping - comparable GPA in three school samples
GENERAL GROUPING SPECIFICATIONS:	Homogeneous grouping evaluated M grouped on IQ and teacher estimate L grouped on achievement and teacher estimate S grouped on teacher estimate, reading test, and IQ
SPECIFIC GROUPING SPECIFICATIONS:	population comparable in GPA across schools
SUBJECT SPECIFICATIONS:	Grouping ex post facto
ACHIEVEMENT FINDINGS:	-
OTHER FINDINGS:	1. most students favored grouping (high - most; middle - least) 2. high group more often chose friends within class; low group chose friends within neighborhood 3. school or community size unrelated to students attitude towards grouping

AUTHOR: Lovell, John R.	YEAR: 1960
GRADE LEVEL:	High School (Bay High School, Panama City, Florida)
STUDENT INFORMATION:	sophomores ability grouped
GENERAL GROUPING SPECIFICATIONS:	Homogeneous versus heterogeneous odd numbered students placed in experimental group to lessen individual difference range - others placed to increase individual difference (250 students in each)

Lovell, John R. (continued)

SPECIFIC GROUPING SPECIFICATIONS:	Experimental group; top 30 - one class next 30 - next class - control group - balance of high, medium, and lows
SUBJECT SPECIFICATIONS:	Grouping manipulated
ACHIEVEMENT FINDINGS:	1. homogeneous made greater achievement in English (upper 1/3 most gains lowest - not significant) 2. no difference in biology and math (trends favored experimental)
OTHER FINDINGS:	1. no difference in self-acceptance and acceptance of others 2. significant difference more favorable student and teacher attitudes in experimental group towards subject and class

AUTHOR: Marklund, Sixten YEAR: 1963

GRADE LEVEL: Elementary School

STUDENT INFORMATION:	6th grade (teacher and class factors controlled) by sub-population examination)
GENERAL GROUPING SPECIFICATIONS:	Homogeneous versus heterogeneous (on IQ)
SPECIFIC GROUPING SPECIFICATIONS:	Extraneous variables controlled Only homogeneity and class size were independent
SUBJECT SPECIFICATIONS:	Grouping ex post facto
ACHIEVEMENT FINDINGS:	Homogeneous grouping has no effect on high or low achievement classes
OTHER FINDINGS:	1. Crux is teacher's method and pupil's habits and extent to which homogeneous affects pupil's activity & reinforcement

AUTHOR: Millman, Jason YEAR: 1964

GRADE LEVEL: Junior High School

STUDENT INFORMATION: New York State Education System
48 school systems - Iowa Test of Basic Skills used

GENERAL GROUPING SPECIFICATIONS: Homogeneous versus heterogeneous
(on initial achievement level
ITBL on English and math)

SPECIFIC GROUPING SPECIFICATIONS:

		English	Math
Gr.7	H	84.3	78.5
	M	75.5-84.2	74.8
	L	75.5	73.9
Gr.8	H	91.8	85.8
	M	84-91	79.3-85
	L	83.9	79.3

SUBJECT SPECIFICATIONS: Grouping manipulated by ITBL pre and post test scores - then it was examined which students were taught in same sections

ACHIEVEMENT FINDINGS:
1. no relation in either English or math between gains and section variability
(ability grouping did not effect achievement)

OTHER FINDINGS: -

AUTHOR: Pattinson, William YEAR: 1963

GRADE LEVEL: High School

STUDENT INFORMATION: 120 students in technical high school (England)
pupils very close in ability levels

GENERAL GROUPING SPECIFICATIONS: Homogeneous versus heterogeneous
(experimental = heterogeneous)
(random)

SPECIFIC GROUPING SPECIFICATIONS: Order of Merit Scores; range 87-596
less difference between marks - no grading of experimental group

Pattinson, William (continued)

SUBJECT SPECIFICATIONS:	Grouping manipulated (experimental or randomly grouped to achieve full spread of ability) - compared to itself when homogeneous grouping was used
ACHIEVEMENT FINDINGS:	-
OTHER FINDINGS:	1. greater student behavior and attitude in heterogeneous group 2. less drop out rate 3. class performance increased

AUTHOR: Peterson, Richard L. YEAR: 1967

GRADE LEVEL: Junior High School

STUDENT INFORMATION: 317 7th & 8th grade students

GENERAL GROUPING SPECIFICATIONS:	Homogeneous versus heterogeneous (standard tests in language and math)
SPECIFIC GROUPING SPECIFICATIONS:	Homogeneous and heterogeneous matched for achievement
SUBJECT SPECIFICATIONS:	Grouping manipulated - comparable ability groups assigned to homogeneous or heterogeneous conditions
ACHIEVEMENT FINDINGS:	1. 8/27 post achievement tests favored heterogeneous
OTHER FINDINGS:	1. majorities of students and teachers favored ability grouping 2. all teachers wanted high sections (only 50% wanted low sections)

AUTHOR: Pfeiffer, Isobel	YEAR: 1967
GRADE LEVEL: High School	
STUDENT INFORMATION: Large suburban school	
GENERAL GROUPING SPECIFICATIONS:	Homogeneous (high) on IQ, grade level, marks and achievement test versus homo (low)
SPECIFIC GROUPING SPECIFICATIONS:	Enriched = IQ ≥ 130 Average = rest Adjusted = below average English marks and two grade levels below on achievement test
SUBJECT SPECIFICATIONS:	Grouping ex post facto for three levels
ACHIEVEMENT FINDINGS:	1. no difference in achievement between high and low ability groups
OTHER FINDINGS:	1. no difference in teacher - student interaction between groups 2. 3/4 teachers of low groups expected little progress 3. teachers in high groups emphasized content more

AUTHOR: Zweibelson, I. et al.	YEAR: 1966
GRADE LEVEL: Junior High School	
STUDENT INFORMATION:	New Rochelle school - 20% Negro sample; mean IQ = 112; same number each sex
GENERAL GROUPING SPECIFICATIONS:	Homogeneous versus heterogeneous (team taught) (on group IQ reading and math test and teacher estimate)
SPECIFIC GROUPING SPECIFICATIONS:	Four homogeneous groups (cut-offs unknown) - equivalent sample team-taught
SUBJECT SPECIFICATIONS:	Grouping manipulated (1/4 highs in each of four quarters) control group matched to experimental group

Zweibelson, I. (continued)

ACHIEVEMENT FINDINGS:	1.	team-taught heterogeneous group achieved as well as homogeneous
OTHER FINDINGS:	1.	heterogeneous group had better attitude towards other students with different SES
	2.	teachers favored team-teaching
	3.	team-taught lower 1/4 students participated more in discussion than equivalent homogeneous group

to examine the effects of homogeneous and heterogeneous grouping on the achievement and attitudes of students. Each student was randomly assigned to one of three heterogeneous sections maintained during the fall quarter. After that two sections were transformed into homogeneous ones on the basis of IQ and the other was left intact as a control group. No difference in mean achievement gains in meterological knowledge was found between the homogeneous and heterogeneous conditions. It was found on a course attitude questionnaire that the low homogeneous group was significantly more discontented with their placement than were other homogeneous groups or heterogeneous groups. Also the low heterogeneous group stated that they often were forced to neglect their other courses for this one in science.

Borg examined differences between homogeneous and heterogeneous grouping on achievement, study habits and methods, social adjustment and pupil peer status and the self-concept and other personality areas. He used two comparable school districts in Utah, one of which employed random grouping (District R), and the other - ability grouping. (District A). Data was collected over a four year period in order to appraise the long term effects of the grouping treatments. Ability grouping in District A was done on the basis of a composite achievement test score (CAT), and three levels were set up (superior, average, and slow). There was found to be no significance between homogeneous and heterogeneous groups (11 levels) on achievement, as measured by the sequential tests of Educational Progress (STEP). There was, however, a tendency for homogeneous grouping to result in greater achievement gains for superior students and random or heterogeneous grouping to result n greater achievement for slow pupils. The ability differences for average pupils did not favor either grouping treatment. On non-achievement measures the heterogeneous group (on the elementary school level) was found to have better study habits. No differences were found between groups in social adjustment. More pupil problems were found to result in the heterogeneous groups. The heterogeneous grouping treatment seemed to result in a more favorable self-concept being held by the students. The homogeneous groups expressed less of a general sense of belonging than did heterogeneous groups.

Cochran examined the program of "flexible grouping" used in junior high schools in Kalamazoo, Michigan. The criterion used for grouping were intelligence test scores, achievement test scores and teacher's estimates of interest, motivation and need. 10% of the student population was randomly assigned to the homogeneous condition (experimental group). Matched students were selected to serve as a control group. Through questionnaires submitted to teachers, it was found that 77% of the teachers were satisfied with the flexible grouping system. There was general agreement that grouping did little to improve the behavior of students or to improve their attitudes towards each other. Changes in teaching method were found in teachers of either high or low groups, but not in the average ones. 1% of the parents reported an increase of interest in school among students grouped homogeneously. There was found to be 65% upward mobility among students in moving from one homogeneous group to another. No differences in achievement as measured by achievement tests at the end of the 8th grade were found between students grouped homogeneously and those grouped hetereogeneously.

Dyson chose two seventh grade populations, comparable with respect to age, intelligence, academic achievement, school grades, school environment and the socioeconomic level of the community. Using the Index of Adjustment and Values (IAV) and the Word Rating List (WRL) Dyson examined possible differences in self-acceptance and academic self-concept between students grouped homogeneously and those grouped hetereogeneously. The homogeneous grouping was accomplished using the following criterion: IQ, achievement, and teacher and principal's evaluation. It was found that grouping did not affect the academic self-concept or self-acceptance. The academic self-concept was shown to be realistically predictive of school success, and also often depended on which group level the student was assigned to.

Goldberg examined the effects of the level and range of grouping on elementary school students. She used as her sample 2,219 students from 45

elementary schools. The homogeneous grouping was done soley on the basis of IQ, and five groups were assigned, each having a range of 10 IQ points. These five groups were then organized in all ways possible (15 combinations) to represent all combinations of ability levels. Grouping was found to have no effect on achievement. Student interest increased with homogeneous grouping. Grouping did not affect students' attitudes towards other and the school. Teachers' appraisals of students were also not affected by grouping.

Sixten Marklund studied achievement gains as related to the size and homogeneity of class in grade 6. Homogeneity was defined by IQ variability on conventional tests. An extremely large sample of more than 4,000 students was used and in order to control for extraneous variables, controlled sub-populations measures were statistically obtained and used. It was found that homogeneous grouping had no effect on achievement in either high or low achieving classes. Marklund inferred that the most important determinant of achievement is the extent to which size and homogeneity of class affects pupil activity and reinforcement (which in turn, according to him, affect the learning process). This means that the teacher's instruction method and the pupil's method of study determine the amount of achievement gains in a given class of students.

Millman and Johnson examined the relationship between achievement gains and section variability (amount of homogeneity in the classroom) on the junior high school level using 48 representative New York State school systems. Grouping was done by the experimenters on the basis of initial achievement level in English and mathematics. The standard deviation on the initial achievement measures served as the measure of class variability and the mean score on the same measure served as the measure of level. No increase in achievement resulted from a decrease in variability (homogeneous grouping) in general. Specifically, a narrow range (homogeneous grouping) may have been of some value to high level sections in mathematics. However, no clear-cut relation between homogeneity and achievement gains was found.

Isobel Pfeiffer examined verbal interaction and cognitive goals of teachers in 11th grade, ability grouped English classes in a large suburban high school. The Flanders Interaction Analysis was completed for two ability level classes for each of five teachers to measure and evaluate teacher-pupil verbal interaction. Bloom's Taxonomy of Educational Objectives: Cognitive Domain was used to analyze cognitive goals of test items from two tests from each class. Categories of analysis were: knowledge, comprehension, application, analysis, synthesis, and evaluation. Three ability levels, formed on the criterion of IQ, grade level and achievement, were used in the system studied. The findings showed no difference in achievement between high and low ability groups. Also no difference in teacher-student interaction was observed at different ability levels. Three-fourths of the teachers of the low group said that they expected little progress from their students. The teachers of the high ability groups were found to emphasize content more. Pfeiffer suggested that the lack of differential achievement between different ability levels may be the result of the lack of differentiated teacher behavior between groups.

Zweibelson, et al. examined the difference between heterogeneous grouping, homogeneous grouping, and team-teaching as manifested in student achievement gains and student and teacher attitudes. He used as his sample a New Rochelle New York junior high school with 1,800 students. Classes were ability grouped using IQ, reading and math test scores, and teacher estimate as criterion, and arranged so that approximately one-fourth of the high-ability students were in the upper quarter, one-fourth in the lower quarter, etc. 100 students at each grade level with one class from each of the four quarters were selected at random to be the experimental (team-taught) students. A matched group of the same size and composition was used as a control measure. It was found that the team-taught heterogeneous group achieved just as well as the homogeneous group (which had not been team-taught) on social studies achievement tests. Students in the heterogeneous sections were found to have

better (more tolerant) attitudes toward other students from different socioeconomic backgrounds. The teachers favored team-teaching. The team-taught low-group students (lower one-fourth in ability) were found to have participated more in the class discussion than when grouped homogeneously and taught by traditional methods.

b. <u>for high ability pupils</u>

Abramson studied the effectiveness of ability grouping for high ability students on the high school level. Effectiveness was taken to be measured by the subsequent progress in college of these students. Four types of grouping done by 154 New York City academic high schools were studied: heterogeneous (controls) grouping, homogeneous in one or two major subjects, homogeneous in most major subjects, and homogeneous throughout the school (only high ability students were admitted to the school). The populations of the different schools as far as the high ability students went was examined and found to be comparable on IQ, sex, and number of students in each level of intelligence. The major finding was that the type of grouping used or extent of it had no effect on the grade point average (GPA) in the first two years of college. Also grouping had no effect on achievement in specific college courses. Finally, women were shown to obtain higher GPA's on the average than the men in the sample.

II. Homogeneous groups <u>better than</u> heterogeneous

a. <u>for all pupils</u>

Baiow examined the effects of homogeneous, heterogeneous and cluster (high + average and low + average) grouping on the achievement at the elementary school level. The sixth grades of four southern California elementary schools were used as the sample. Homogeneous grouping was done using as a criteria the results of an achievement testing program, and four groups were formed. Clustering was done on the basis of IQ and teacher estimate of emotional stability. The Metropolitan Achievement Test was used to measure achievement gains at the end of one

school year. The trend of the results was that the cluster groups had the highest growth in general ability, the homogeneous groups achieved on the second highest level and the heterogeneous had the lowest achievement score. Also it was found that the achievement gain of a student or a group of students was inversely proportional to the initial rank.

Cawelti studied ability grouping programs in 42 North Central Association high schools in Iowa, Illinois, Minnesota, and Wisconsin. A preliminary survey showed that all of these schools grouped on at least three different ability levels in ninth and tenth grade English and mathematics. Results or descriptive knowledge of grouping practices were obtained through interviews with principals and counselors and teacher questionnaires. Homogeneity was achieved through the criterion of IQ, achievement test scores, and past grades. The results were that mean class size was found to be significantly larger for the higher ability groups. The teachers did not feel that bad social attitudes (i.e., conceit, snobbery and/or prejudice) were a result of grouping practices. 88% of the principals felt that grouping was good and resulted in higher achievement by the students involved. The teachers of the high ability groups felt that they were better prepared in their classes than did those who taught lower-level groups.

Klausmeier asked high school students and teachers in three schools to evaluate the sectioning practices used in their school. The schools were comparable on type of sectioning and the GPA of the students in each of the populations. The results of questionnaires and interviews were that most students favored grouping by ability, with the high level students favoring it most and the middle level students least. The high level students also were proven to choose their friends most often on the basis of those in the same class section as themselves, whereas lower level students were found to choose their friends on the basis of geographical closeness (i.e., same neighborhood). The last finding was that the size of the school or community was unrelated to the attitude of the student towards

the practice of grouping.

Lovell evaluated the experimental method of grouping used at Bay High School in Panama City, Florida. The sophomore class was grouped by ability and then odd-numbered students were put into the experimental group (homogeneously grouped to reduce variation in all English, biology and algebra classes) and even-numbered students served as the controls (heterogeneous group). Standardized achievements tests, a sociometric instrument, the Index of Adjustment and Values and a student attitude questionnaire were employed to discover the effects of the grouping on the students. The homogeneously-grouped students were found to have made significantly greater gains in English, with the upper one-third of this group (high-homogeneous) making the greatest gains and the low-homogeneous group taken alone making insignificant achievement gains. No differences in achievement gains were found in either biology or mathematics, but the trends were in favor of the experimental (homogeneous) group. No difference was found between the two groups in measures of self-acceptance or acceptance of others. Student and teacher attitudes towards the class and subject matter were found to be more favorable among those involved in the experimental homogeneous grouping.

b. <u>for high group</u>

Howell studied the effects of grouping on high ability students in Penfield High School. Penfield is a middle-class, completely residential suburb of Rochester. The high school population has a median IQ of 114; 75% of the students continue their education after high school, with 60% entering four year colleges and universities. In this study an experimental 9th grade honors section (high-homogeneous) was chosen using the criterion of IQ, achievement tests, past grades, counselor and psychologist's judgment, teacher judgment and parental permission. Using final grades as a measure it was concluded that the high-homogeneous group achieved higher than those high ability students grouped heterogeneously. Grouping

did not seem to have led to the development of any undesirable social characteristics. Also grouping was seen to result in the development of a more realistic view of individual ability of the part of these high-level students.

c. for low group

Borg and Prpich compared the performance of slow learning high school pupils in ability grouped and heterogeneously-grouped English classes. The low homogeneous group (and a comparative random or control group) was made up of those students with an IQ between 70 and 90 and grade placement of 8.2 or lower on English achievement measures. Results were found using the Pintner General Ability Test and the Metropolitan, an English achievement test, both of which were routinely administered near the end of 9th grade to both groups of students. Teacher and pupil attitudes were also examined using standardized surveys, tests, indices and questionnaires. No difference between the two groups was found on measures of English achievement, though the homogeneously-grouped students were found to have higher achievement on the STEP test in the second year. Teachers gave higher estimates of ability to the homogeneous group. No difference was found in study methods or attitudes. The homogeneously-grouped students participated more frequently and on a higher level in class. The homogeneous group had a more favorable attitude towards English, and also more favorable self-concepts.

III. Heterogeneous groups were better than homogeneous

a. for all pupils

Pattinson compared a randomly-grouped school to a streamed school, both of which he had worked in. His experimental group was composed of 120 students in a technical high school in England. These pupils were known to be very close to each other in ability (as measured by their previous scores on the Order of Merit exam). No subject or form lists, or promotions or deductions were done in this school system. He concluded

that better student behavior and attitudes were found in a heterogeneously-grouped situation. There was a lower student drop-out rate from this school. Class performance, as a whole, also was found to increase in the random group situation.

Peterson studied the effects of ability grouping on grades 7 and 8 in Chisolm Junior High School, Chisolm, Minnesota. Achievement, student attitudes and teacher attitudes were examined. Homogeneous grouping was accomplished using standardized exam scores in language and mathematics as criterion. In 8 out of 27 post-achievement tests the heterogeneous group was found to do better. The majority of students and teachers favored ability grouping. All of the teachers wanted to teach only high level section, whereas only 50% of the teachers wanted to teach any low ability sections.

IV. Conclusions

An evaluation of the literature reviewed here leads to the conclusion that homogeneous ability grouping provides little if any advantage in school performance. Conclusions are difficult to draw from this data since the studies were done with different age groups, using different grouping criteria, and different outcome measures. However, considering all sources of variability, the case for ability-grouping is clearly <u>not</u> made by this literature.

METHODS

I. Collection of Raw Data

In order to examine and perhaps better understand some effects of grouping or tracking on high school students, data were collected from a local high school.

Essentially, the following five empirical questions were posed:

1. What is the probability that a senior will be grouped at the same level in both English and Social Studies?

2. Is there a relationship between the curriculum a student is in (e.g., honors, college prep., vocational, etc.) and the level at which he is grouped in English and Social Studies?

3. Is there a relationship between scores on less verbal IQ tests taken in elementary school and more verbal ones taken in high school?

4. Is there a relationship between IQ test scores and the level at which a student is grouped in English and Social Studies?

5. What is the relationship between attendance (number of days absent) and IQ test scores, grouping level in English and Social Studies, and the curriculum a student is in?

English and Social Studies were chosen because all of the seniors were taking a course in each of these areas. Moreover, minimally grouping levels were operative in each area.

The above questions were aimed at generating inferences rather than at reaching conclusions. If students are grouped in like fashion in different subject matters, and if such assignment relates to

curriculum and IQ, then one must become suspicious of the locking-in quality and self-perpetuating (and perhaps self-fulfilling) quality of the system.

The research proposal was presented and discussed at a meeting with the high school superintendent and other administrative officials. Permission was then obtained to meet directly with the high school principal, head guidance counselor and the head of the data-processing department. The permanent records of the junior and senior year students were made available. Included in these records were standardized test scores, grades for the tenth grade to the present time, attendance rates, etc.

The sample was chosen randomly (by data-processing equipment) using as a basis the 11th and 12th grade level English sections. The field of English was chosen because it is the one which is more finely divided or grouped. Approximately 15 to 20 students were randomly selected from each English section and listed on an IBM print-out by name and student number. For each student chosen for the sample, all other courses (and grades) in which they were presently enrolled were also listed. For the seniors, their last year's courses and grades were obtained.

Attendance records for all students in the sample were collected. The standard test scores of the present seniors were obtained. The curriculum level (college preparatory, business, etc.) for all students were also listed.

II. Preliminary Organization of Raw Data

The raw data described in the first section of this paper were then rearranged and transcribed onto sheets with appropriate columns. Subjects were listed only by their student numbers. For seniors only, the following information was given: grouping level in English and Social Studies, curriculum level, attendance (number of days absent), and scores on five standardized tests:

1. Otis Beta IQ Test, given in seventh grade
2. Iowa Reading Test, given in seventh grade

3. SRA Primary Mental Abilities, given in eighth grade
4. Differential Aptitude Test, given in ninth grade
5. Otis Gamma IQ Test, given in tenth grade

RESULTS

1. It was found that many more students were in the same grouping level across two subjects than would be expected to occur by chance. Out of the 161 students in the sample, 94 were grouped in like fashion in English and Social Studies while the remaining 67 were grouped at different levels. The probability of grouping 58% in like manner by chance is .0001 ($Z = 6.67$).

It is possible to infer that a bias exists in the grouping system. It is likely that a student will be in the same group in more than one subject. Indeed the level he is placed in in one subject may predispose his grouping in other subjects. Another implication of this initial result is that the criterion for grouping is external (i.e., additional) to ability or achievement in the specific subject area.

2. In order to investigate the relationship between the curriculum a student is in and the grouping level he is in for English and Social Studies, the data were cast in two-way contingency tables. The dependency between curriculum and grouping level was tested by means of the chi-square statistic. The cell frequencies and resulting chi-square values are given in TABLES III-2 and III-3. In both cases the observed chi-square value is significant at the .001 level of confidence. This result indicates that grouping level is related to the curriculum track in which a student is found. One possible interpretation of this finding is that the curriculum tracks are used as the basis for grouping or that curriculum track placement leads to an expectancy within faculty and student which predisposes the student to perform in a certain manner and is thus grouped accordingly.

3. The intercorrelation among the five standardized test scores were calculated to assess the interrelation-

TABLE III-2

CHI-SQUARE TEST OF INDEPENDENCE BETWEEN CURRICULUM AND GROUPING LEVEL IN ENGLISH

CURRICULUM	GROUPING LEVEL 1	2	3	4	TOTALS
College Prep.	27 (10.5)*	24 (13.07)	6 (18.88)	0 (19.24)	57
Business	2 (7.2)	7 (8.94)	22 (8.41)	8 (8.66)	39
Vocational	0 (7.2)	3 (8.94)	5 (8.41)	31 (8.66)	39
General	0 (4.06)	2 (5.04)	6 (5.47)	14 (5.61)	22
TOTALS	29	36	39	40	157

$\chi^2 = 177.92$ df = 9 $p < .001$

*Numbers in parentheses are expected values

TABLE III-3

CHI-SQUARE TEST OF INDEPENDENCE BETWEEN CURRICULUM AND GROUPING LEVEL IN SOCIAL STUDIES

CURRICULUM	GROUPING LEVEL 1	2	3	4	TOTALS
College Prep.	9 (3.93)	29 (14.64)	16 (19.28)	1 (17.14)	55
Business	1 (2.85)	9 (10.65)	20 (14.03)	10 (12.47)	40
Vocational	1 (2.64)	1 (9.85)	9 (12.97)	26 (11.53)	37
General	0 (1.57)	2 (5.86)	9 (7.71)	11 (6.86)	22
TOTALS	11	41	54	48	154

$\chi^2 = 76.78$ df = 9 $p < .001$

ships among these variables. The correlations and the frequencies upon which the correlations were based are given in TABLE III-4. All correlations are significant at the .01 level of confidence.

The correlation between student scores on the Otis Beta IQ test, a non-verbal test given in the elementary grades, and their scores on the Otis Gamma IQ test, a verbal test given in the secondary grades, was +.88. This correlation was obtained on the 65 students in the sample for whom both scores were available. A correlation this high is likely to occur by chance fewer than one time in one hundred. It indicates that the two tests are highly related, i.e., students scoring high on non-verbal skills early in their academic career are scoring high on verbal skills later in their academic career. The same is true of low scorers. An ideal education system should serve to reduce this correlation. Its magnitude further suggests the operation of the self-fulfilling prophecy.

4. The relationship between the standardized test scores and the grouping levels in English and Social Studies were examined by means of a correlational analysis. The results are given in TABLE III-5. The correlations ranging from -0.62 to -0.79 were significant at the .01 level of confidence. Recalling that in the grouping levels, 1 was the most advanced group and 4 the least, the significant negative correlations reflect the fact that students in the advanced groups have higher scores on all the tests. Such a result is not a surprising one. However, it is of interest to note the high degree to which grouping levels in grade twelve are related to scores on standardized tests given in grade seven.

5. The attendance record (number of days absent) during the 1967-68 school year was obtained for each student in the sample. Correlations were then calculated between number of days absent and the standardized test scores. The obtained values ranging between -0.29 and -0.45 were significant at the .01 level of confidence. The results are given in TABLE III-6. The negative relationship indicates the tendency for students with low standardized test scores to be absent more from school.

The relationship between attendance and grouping

TABLE III-4

CORRELATION MATRIX

(Sample Sizes in Parentheses)

		1	2	3	4	5
1.	Otis Beta (Grade 7)	1.00	0.83 (98)	0.86 (95)	0.80 (96)	0.88 (65)
2.	Iowa Reading (Grade 7)		1.00	0.81 (97)	0.73 (98)	0.82 (68)
3.	SRA Reading (Grade 8)			1.00	0.78 (112)	0.87 (77)
4.	Differential Aptitude Test (Grade 9)				1.00	0.89 (94)
5.	Otis Gamma (Grade 10)					1.00

TABLE III-5

Correlations Between Standardized Tests And Grouping Levels

GRADE	TEST	GROUPING LEVEL IN GRADE 12	
		ENGLISH	SOCIAL STUDIES
7	Otis Beta	-0.74	-0.65
7	Iowa Reading	-0.71	-0.68
8	SRA Reading	-0.72	-0.66
9	Differential Aptitude	-0.73	-0.62
10	Otis Gamma	-0.79	-0.70

TABLE III-6

Correlations Between Attendance And Standardized Test

	ATTENDANCE	
Otis Beta	r = -0.29	(n = 100)
Iowa Reading	r = -0.24	(n = 100)
SRA Reading	r = -0.35	(n = 114)
Differential Aptitude	r = -0.34	(n = 130)
Otis Gamma	r = -0.45	(n = 107)

levels is shown graphically in FIGURE III-1. The mean number of days absent within Social Studies increases linearly from 7.0 days for grouping level 1 to 18.75 days for grouping level 4. Similarly, the increase within English is from 10.23 days for level 1 to 18.21 days for level 4.

The mean number of days absent within curriculum groups is depicted in FIGURE III-2. A high average rate of absenteeism was found for students in the business and vocational curriculums (17.16 and 19.53 days, respectively). Whereas, the college preparatory and general curriculum groups have relatively low rates of absenteeism (11.14 and 10.50, respectively). Thus, while students in the less advanced grouping levels are absent more than those in the advanced groups, the result is limited to students in the business and vocational curriculums.

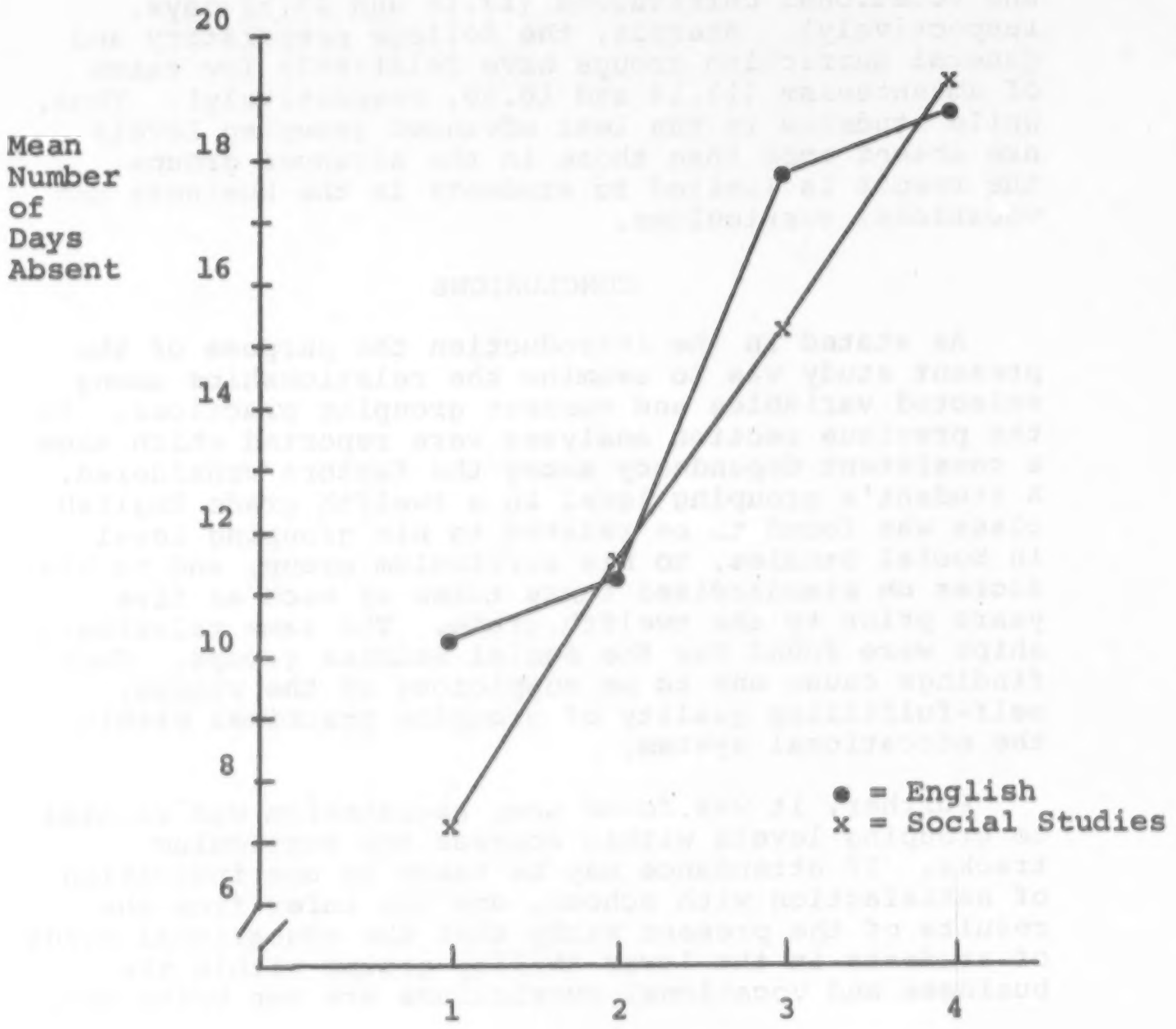
CONCLUSIONS

As stated in the introduction the purpose of the present study was to examine the relationships among selected variables and current grouping practices. In the previous section analyses were reported which show a consistent dependency among the factors considered. A student's grouping level in a twelfth grade English class was found to be related to his grouping level in Social Studies, to his curriculum group, and to his scores on standardized tests taken as much as five years prior to the twelfth grade. The same relationships were found for the Social Studies groups. Such findings cause one to be suspicious of the closed, self-fulfilling quality of grouping practices within the educational system.

Further, it was found that absenteeism was related to grouping levels within courses and curriculum tracks. If attendance may be taken as one indication of satisfaction with school, one can infer from the results of the present study that the educational needs of students in the lower ability groups within the business and vocational curriculums are not being met.

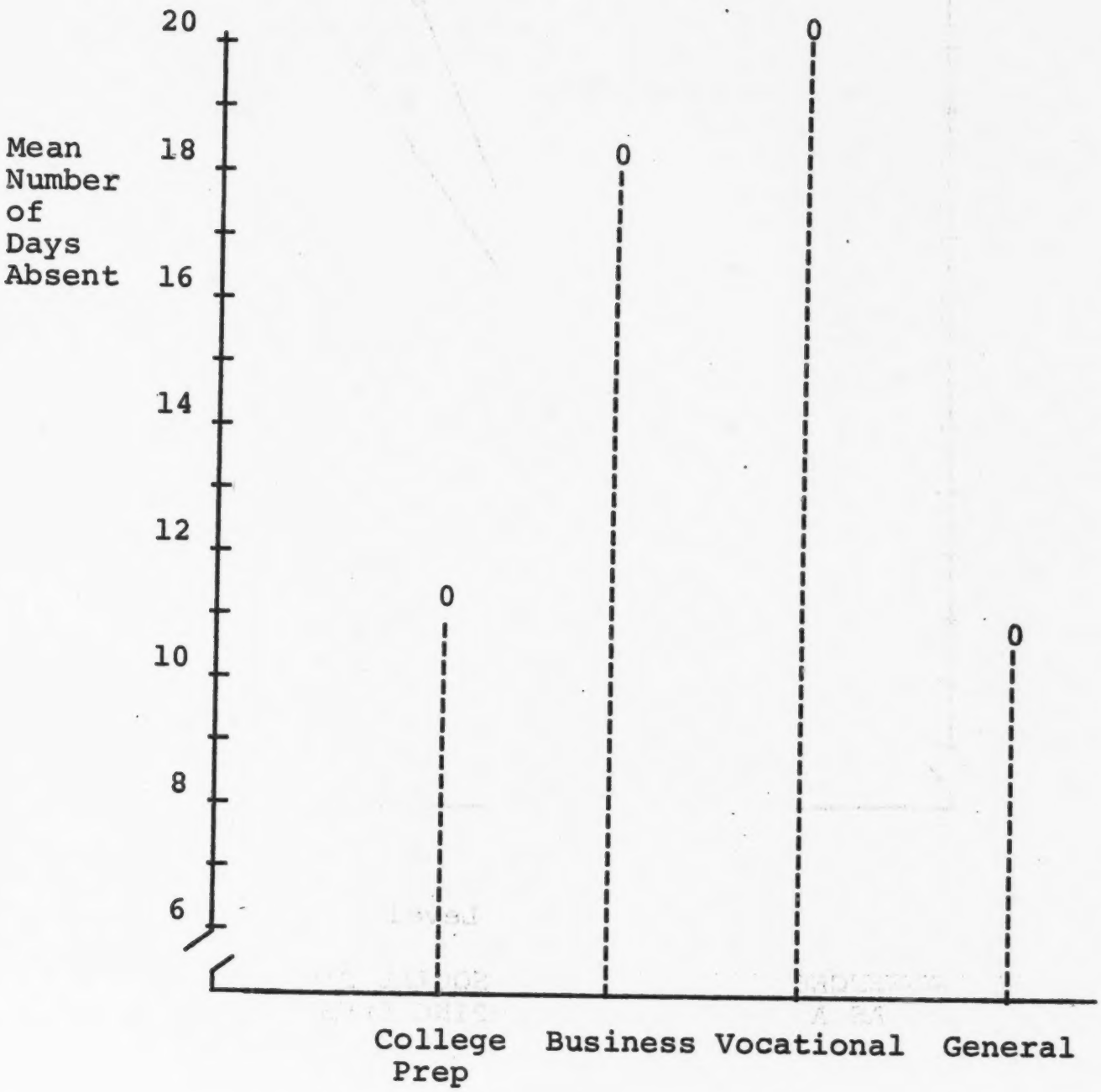
The purpose of the SCOPE Project is to design occupationally relevant curriculums for high school students. The aim of such design is to vocationalize

FIGURE III-1



ABSENCES IN ENGLISH AND SOCIAL STUDIES
AS A FUNCTION OF GROUPING LEVEL

FIGURE III-2



ABSENCES AS A FUNCTION OF CURRICULUM

3

all subjects within an individualized, integrated curriculum. The present study has added empirical validity to our main assumption that projects such as SCOPE are necessary to provide relevant education for the vocationally oriented, non-college bound student.

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APPENDIX III-A

Questions on the Range of Individual Differences in the High School and Techniques Used for Dealing with Diversity*

I. Grouping procedures (sometimes called "tracking")

1. Does your high school employ grouping procedures to deal with student diversity?

2. How many groupings are there? How do these vary by subject matter?

3. What curriculums (courses) are covered in the different groups? In what way are these similar and different in subject matter? In skill level?

4. What is the average class size of classes in the different groups?

5. What criteria are used for initial assignment of students to different groups in the various subject matters?

   a. What are the criterion indices (i.e., measures or judgments on which classification is based?

   b. What are the cutoff scores on these indices?

   c. How are these indices combined or weighted in making a grouping decision?

   d. How were these criteria determined (what basis)?

6. What procedures other than grouping are used for dealing with student diversity (e.g., programmed instruction, tutoring)?

II. Objective characteristics of the students in the different high school groupings

7. What is the dropout rate in the different groupings? The attendance rate?

8. What percentage of students move from each of the groups to higher groups during high school? What percentage move to lower groups?

9. What is the probability that a student will be in the same group across all subject matters?

10. What is the average score for students in each of the groups on standardized measures of achievement, and reading level at different grade levels?

11. What relative gains or losses do students in each of the groups show in achievement, intelligence, and reading level measured from high school entry to graduation?

12. Are the performances of students in the different groups more similar in the freshman or the senior years?

13. Is final student ranking in the graduating class influenced by the group that the student is in?

III. Self concept of students in the different groups

14. What do graduates of the different groups do upon graduation?

15. What are subjective impressions of self (self-worth, growth) among students in each of the groupings?

16. What are the attitudes of students in the different groups toward the education they are receiving?

17. What percentage of students in each group participate in extra-curricular activities? Who participates in what type of activities (i.e., student government, sports, publications)?

18. How many students in each group hold part-time jobs outside of school?

19. What are the expressed hobbies or outside interests of the students in different groups?

20. For students in different groups, what is the income level of the family? Number of other children in the family?

21. What are the expressed favorite subjects or school activities of students in different groups?

22. Does student motivation (as measured by grades, college entrance, jobs) differ among students in different groups?

23. Does the amount of teacher enthusiasm and affection for students change for different groups?

IV. The high school teacher and grouping

24. What performance expectations do teachers have for students in the different groups?

25. What kind of supervision do teachers receive relative to their dealing with the different groups?

26. Are the teachers aware of what is being covered in their area in the different groups and are they attempting to cover the same concepts at an appropriate level?

V. The educational system

27. Has grouping in your high school ever been evaluated?

28. Has heterogeneous grouping recently been tried in your high school? What were the outcomes?

29. How many innovations have been undertaken in your high school within the past five years? What were they?

30. How do your high school students compare to others on national norms?

* The above questions are suggestive of a somewhat complete list that might be used in a larger post hoc study of ability-grouping.

Part IV A Systems Model (Short-term) for Achieving Inter-disciplinary Education (The Willingboro Project in Communication Arts and Technologies*)

INTRODUCTION

During the first year of the SCOPE Project, a taxonomic model had been developed for classifying behavioral objectives in order to produce the conditions by which learning can take place. This model has been described in Part I.

The next step in the program was originally identified as being the collection of behavioral objectives from the various subject matter areas. These objectives were to be "fed" into the model via a computer program in an attempt to validate the model and to determine if some insight could be gained as to new directions toward the construction of curricula that were interdisciplinary in nature, i.e., curricula that revolved about psychological processes that encompassed all subject matter areas, as opposed to curricula developed from distinct disciplines. If such proved to be possible, then the model could be used as a vehicle to produce learning programs that were more relevant to the needs of students, especially the majority of them who do not obtain a baccalaureate.

Unfortunately, our search for behavioral objectives was unproductive, and led us at the end of the first year to question whether enough of these objectives existed to enable us to accomplish our goals. It seemed more realistic to classify these endeavors as long-range in scope, and to concentrate on broadening our objectives in such a way that more immediate pay-offs could be realized. Thus, our search concentrated on discovering ways to utilize the model in producing an interdisciplinary approach to curriculum development that would yield results more quickly. Our primary solution was to construct an experiment for testing the taxonomy (see Part I).

While we were developing the taxonomy, we were working with

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* This project was conceived but not carried out because Willingboro was not able to secure funds from either Federal, state, or local sources. Since project time was spent in its conception, and the idea may be picked up by others, it is being described in this report.

a network of public schools called the Educational Systems for the Seventies (ES '70). This network was designed to be a testing ground for such innovations as the interdisciplinary curriculum. While other University groups such as ourselves had been working with ES '70, the relation between University and public schools in the development and implementation of educational innovations was unclear. We, however, saw in this relationship the potential for the development of a short-term curriculum development strategy to complement the long-term strategy that our taxonomic approach represents.

The plan of this part of the report, then, will be to describe our plan for ES '70 -- a strategy for immediate change, and then describe the Willingboro Project, a project designed to test the plan. The mechanics of that plan, both general and specific, will then be described. Finally, the outcomes will be covered.

A PLAN FOR ES '70

It would appear that the Educational Systems for the '70's program has not achieved that degree of change and visibility that was originally intended for it. To an observer, the ES '70 approach looks like two concentric circles, with the inner circle representing the network of eighteen cooperating schools systems and the outer circle representing the university groups who are attempting to provide the building blocks for some sort of integrated curriculum. It is interesting to note some of the characteristics of this strategy. First off, the two circles do not touch. The university people have worked independently of school district people in moving toward their objectives. Secondly, the curriculum, which is to be built essentially by university people, is a long way off in its potential culmination, and there is no guarantee that, even upon fruition, the curriculum so constructed will be acceptable and amenable to the schools.

Thirdly, the curriculum development activities undertaken by the professional people, i.e., the outer circle, are extremely costly, and for this reason it would seem that not too many contracts have been let. And finally, the inner circle schools who await the development of a

curriculum bide their time in the interim by acting essentially in the absence of university level advisement and counsel on a variety of programs which, taken together, do not lead to the identification of a central, easily identified theme. Thus, ES '70 does not have a strong conceptual base.

In terms of these observations, one is inclined to suggest that the ES '70 strategy should be modified in the direction of more concrete, short-term pay-offs, and in terms of a clear thematic orientation. This recommendation suggests at the administrative level that two techniques or approaches be featured. The first of these approaches would be to identify a theme or philosophy or, if you will, a set of ground rules to guide all activity undertaken within ES '70 through USOE funding. The ground rules must be comprehensive enough to provide a justifiable and rational philosophy consistent with USOE policy, and even more particularly with the orientation of the Division of Comprehensive and Vocational Research. At the same time the ground rules must be sufficiently flexible to allow for a variety of approaches that, while consistent with them, may be used to create an educational system for the '70's.

The second approach to be advocated concerns research management. A recommended research management approach appears below. From four to six professional teams would be identified having the following characteristics.

a. are spread across the country geographically to provide for cross-national representation.

b. are so situated as to provide the possibility for commuting to a minimum of two of the ES '70's schools.

c. are oriented toward the ES '70 philosophy or ground rules which are alluded to above and will be detailed below.

d. are made up of professional personnel who are committed to educational innovation and change and who have talent in the areas of curriculum development, administration, behavioral psychology, and instructional technology, in order to achieve the kinds of changes that would be consistent to the philosophy advocated.

Within the research management strategy, five or six such centers would be contracted at an initial level of funding of about $100,000 per center for the first year (with the total program thus running about 1/2 million dollars) in order to produce innovative programs in a minimum of two of the ES '70 schools within a one year period. Moreover, these new programs would be consistent with the ES '70 ground rules. How these programs were to be developed and implemented would be a function of the center personnel and the school district personnel working together to create the kind of team that would seem most ideal to produce change, i.e., university disciplinarians with a strong research interest and a wide range of information combined with school people who are considerably more adept at producing change within the real system of the school. Taken together, it seems reasonable to expect that such a combination of talent may be optimal for producing the kind of change toward which ES '70 aims.

Rather than two concentric circles, the aim would be to produce two circles that are interconnected at many points. The ES '70 Newsletter could be used to disseminate the activities of the five centers working with the ES '70 schools so that other centers and other schools could adopt these programs if they so desired. At annual and semi-annual meetings, center and school district personnel would report the development and implementation of programs. Programs would be borrowed and adopted from other places in the country, fitted to the individual needs of the schools, and evaluated in a systematic way by the establishment of comparison groups. Attempts would be made to both create the change and understand the dynamics behind its occurrence.

The ES '70 philosophy (or ground rules) must be one that the eighteen school systems and five hypothetical centers find compatible, and that is acceptable to the Division. In a recent paper entitled "A Student Centered Curriculum,"* I advocate the following as ground rules or specifications for an educational system of the future.

1. Programs of the future must be goal-oriented. They must be developed through the use of behavioral objectives.

2. They must be vocationally-oriented emphasizing both skill development and a general vocationalizing trend in the secondary school program.

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* See Part V of this report.

3. These programs must be learning-style oriented, that is, they must be individualized to meet individual needs.

4. They must be developmentally oriented; specifically, they must make greater use of the concrete in order to maximize their relevance. Relevance, of course, is also maximized through the use of goal-orientation.

5. They must be learning sequence oriented. Instead of being organized by subject matter, they must be concerned with sequences of learning experiences.

6. They must feature integration or combination of subject matter into meaningful units.

7. They must feature learning through interaction with the environment, that is, a learning experience approach, and

8. Insofar as possible, they must make maximum use of educational technology.

Working within the framework of this philosophy, each of the university centers would sit down with the two or three ES '70 schools that they had selected and would plan for three year's worth of activities in one-year segments which would represent an attempt to facilitate the introduction of the ES '70 philosophy through the implementation of specific programs in the schools in question. The university people, functioning as part of the team, would be responsible for identifying and suggesting programs that have met with some degree of success in other parts of the country and which seem to be adaptable for use in the school system in question. In addition, they may choose to undertake specific developmental work relying on staff members and graduate students in addition to taking advantage of teacher talent and administrator's time where possible.

The actual strategy of development and implementation will be up to the team. To this end, the advise and suggestions of local school people would be invaluable, since they know their own system best. Working together, they will attempt to produce and evaluate programs that can then provide visible evidence of the ES '70 philosophy and its effect when made operational.

It is unfortunate that professional university people and school district personnel have operated in isolation for so long. It is more unfortunate that the separation has been continued within something as progressive as the ES '70 movement. It is time for the decision makers associated with the ES '70 program to recognize that what may be the most effective strategy for change is to bring committed university people with wide ranging skills and information into specific school systems to put their expertise to work in helping to develop, implement, and evaluate concrete in-school programs. This approach will tie the theoretical to the practical and produce the kinds of visible evidence that ES '70 would seem to need in order to fulfill the expectations which others have for it.

To test the feasibility of this plan, it was decided to design and carry out a project working in conjunction with one of the ES '70 school systems. In this way it would be possible to test the plan as an effective short-term strategy for curriculum development and implementation.

THE WILLINGBORO PROJECT

A most interesting development was becoming visible in Willingboro, New Jersey. This rapidly growing suburban area rests amidst a plethora of television stations. The school system itself, a member of the ES '70 network, is equipped with a most adequate television studio and is, in fact, connected by cable with a local educational television station. It seemed only natural, therefore, that the school develop a program to prepare students with job entry skills necessary for employment in a television studio. Inquiries by school officials found television management most receptive to the idea. The school was assured of the need for such people and the availability of immediate employment.

The program that we planned to develop conjointly with Willingboro was to concentrate on the construction of programs (curriculums) for three job clusters -- those skills inherent in the operation of the television equipment (producing, audio and video controlling, camera and VTR operation, etc.), those skills employed before a camera (announcing, scripting, set development, lighting, staging, etc.), and those defined as office and management skills. Teachers, students, television personnel, and educational consultants were to be brought together during the first

year (see FIGURES IV-1 and IV-2) to identify such programs, to develop related behavioral objectives that were interdisciplinary in nature, (a task that has had little or no precedent in education to this point), and to prepare learning packets as determined by the task analysis and behavioral objectives. Testing, evaluating, and refinement were to proceed concomitantly with the development of materials and packets. The administration was to be responsible for preparing the teaching-learning schedule necessary for eventual implementation of the program.

The second year of the program* was to see the schedule in action with students involved in each job cluster doing all of the work necessary for the production of educational television tapes. Continuous evaluation and refinement was to be a part of the program. The third year of the program (the second for the students) was to be built upon the evaluations and refined.

A program in communication arts and technologies (COMARTECH or CAT) has great significance for vocational education. Performance objectives have been developed to some extent for the separate subject matter areas. None exist, however, for an interdisciplinary approach using communications as an integrating agent. When fully developed and operational, this program could have served as a prototypic model for other communication media. The potential for its use in other areas of education seems equally unlimited.

A SYSTEMS MODEL FOR INSTRUCTIONAL DESIGN AND MANAGEMENT**

The purpose of this section is to describe a systems model

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* Had this program been implemented we were planning to attempt to secure continuation funds for SCOPE in order to see the project out.

** This section was originally prepared as SCOPE Incidental Report #3. A shortened version will appear soon in Educational Technology magazine under the joint authorship of B. W. Tuckman and K. J. Edwards.

FIGURE IV-1

RUDIMENTARY DIAGRAM OF THE BASIC STEPS
IN THE WILLINGBORO PROJECT

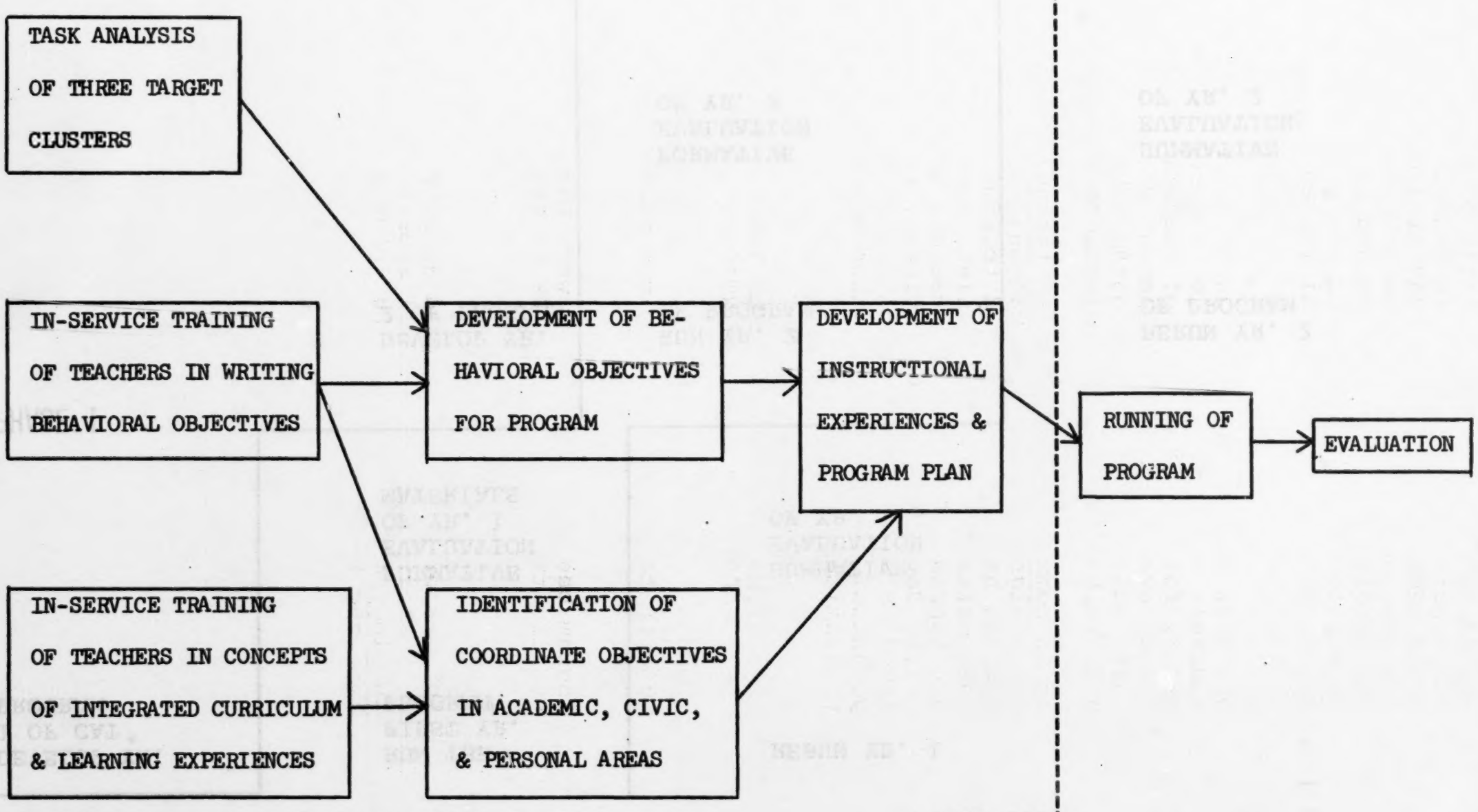

TASK ANALYSIS OF THREE TARGET CLUSTERS
IN-SERVICE TRAINING OF TEACHERS IN WRITING BEHAVIORAL OBJECTIVES
DEVELOPMENT OF BEHAVIORAL OBJECTIVES FOR PROGRAM
DEVELOPMENT OF INSTRUCTIONAL EXPERIENCES & PROGRAM PLAN
RUNNING OF PROGRAM
EVALUATION
IN-SERVICE TRAINING OF TEACHERS IN CONCEPTS OF INTEGRATED CURRICULUM & LEARNING EXPERIENCES
IDENTIFICATION OF COORDINATE OBJECTIVES IN ACADEMIC, CIVIC, & PERSONAL AREAS

FIGURE IV-2

SEQUENTIAL PHASING OF THE WILLINGBORO PROJECT

1969-70	1970-71	1971-72	1972-73
PHASE I	PHASE II	PHASE III	
DEVELOP YR. 1 OF CAT* PROGRAM	RUN THE FIRST YR. PROGRAM	RERUN YR. 1	
	FORMATIVE EVALUATION OF YR. 1 MATERIALS	SUMMATIVE EVALUATION OF YR. 1	
	DEVELOP YR. 2 OF PROGRAM	RUN YR. 2 OF PROGRAM	RERUN YR. 2 OF PROGRAM
		FORMATIVE EVALUATION OF YR. 2	SUMMATIVE EVALUATION OF YR. 2

*Communications, Arts & Technologies

for the design and management of instruction in general. It was the model which was to be employed in the Willingboro project. The model provides for certain critical features; it proceeds in a systematic fashion; it builds in the feature of relevance; it deals with measurable behaviors; and it specifies the relationship between learnings to be achieved.

The model is broken down into three phases. The first phase, called analysis, contains the following three activities in sequence: (1) specification of occupational tasks via task analysis, (2) restatement of tasks as behavioral objectives, (3) specification of a sequence for behavioral objectives (structural analysis). Following the analysis phase, the synthesis phase is undertaken. This phase involves two activities occurring in parallel: (1) specification of instructional activities, and (2) design of evaluative procedures. The final phase of operation includes two simultaneous activities: (1) carrying out of instructional activities, and (2) the collection of evaluative data. Following these three phases comes a fourth activity, a feedback and iteration wherein the data collected during the phase of operations is fed back into the analysis so that it can be tested, validated, and redesigned based on input data. This redesign based on feedback is then followed through to its completion from that point. This model is shown diagrammatically in FIGURE IV-3.

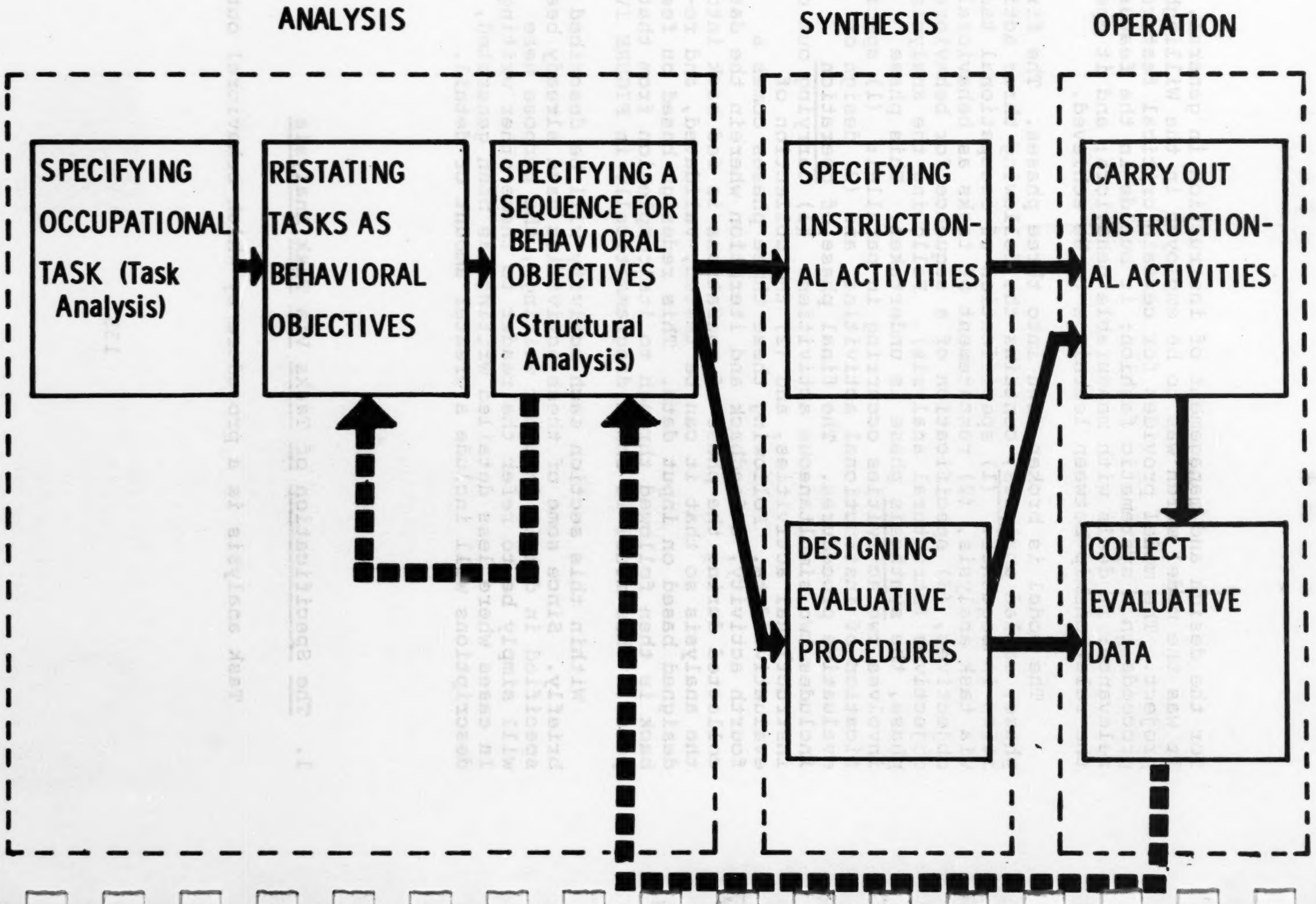
Within this section each activity will be described briefly. Since some of these activities have already been specified in detail in other writings, the purpose here will simply be to refer the reader to these other writings. In cases where less detailed writing has been generated, descriptions will include a greater amount of detail.

1. The Specification of Tasks Via Task Analysis

Task analysis is a procedure by which behavioral out-

FIGURE IV-3

A SYSTEMS MODEL FOR INSTRUCTIONAL MANAGEMENT



comes that are desired are specified in the form of tasks. That is, some final behavioral capacity is analyzed into a series of those tasks that make it up. Task analysis has been most heavily employed in the vocational or occupational field. Here if one chooses to consider an occupation such as an electronics technician, one would take this occupation and attempt to specify the tasks that an electronics technician is to perform. Similarly, if one wanted to conduct a task analysis of the occupation of secretary, one would take the occupation and analyze it into the tasks that make it up. A task analysis of the secretarial occupation might include such tasks as typing a letter, taking messages, preparing and organizing reports, taking dictation from live stenographic material, a dictating machine or tape, etc.

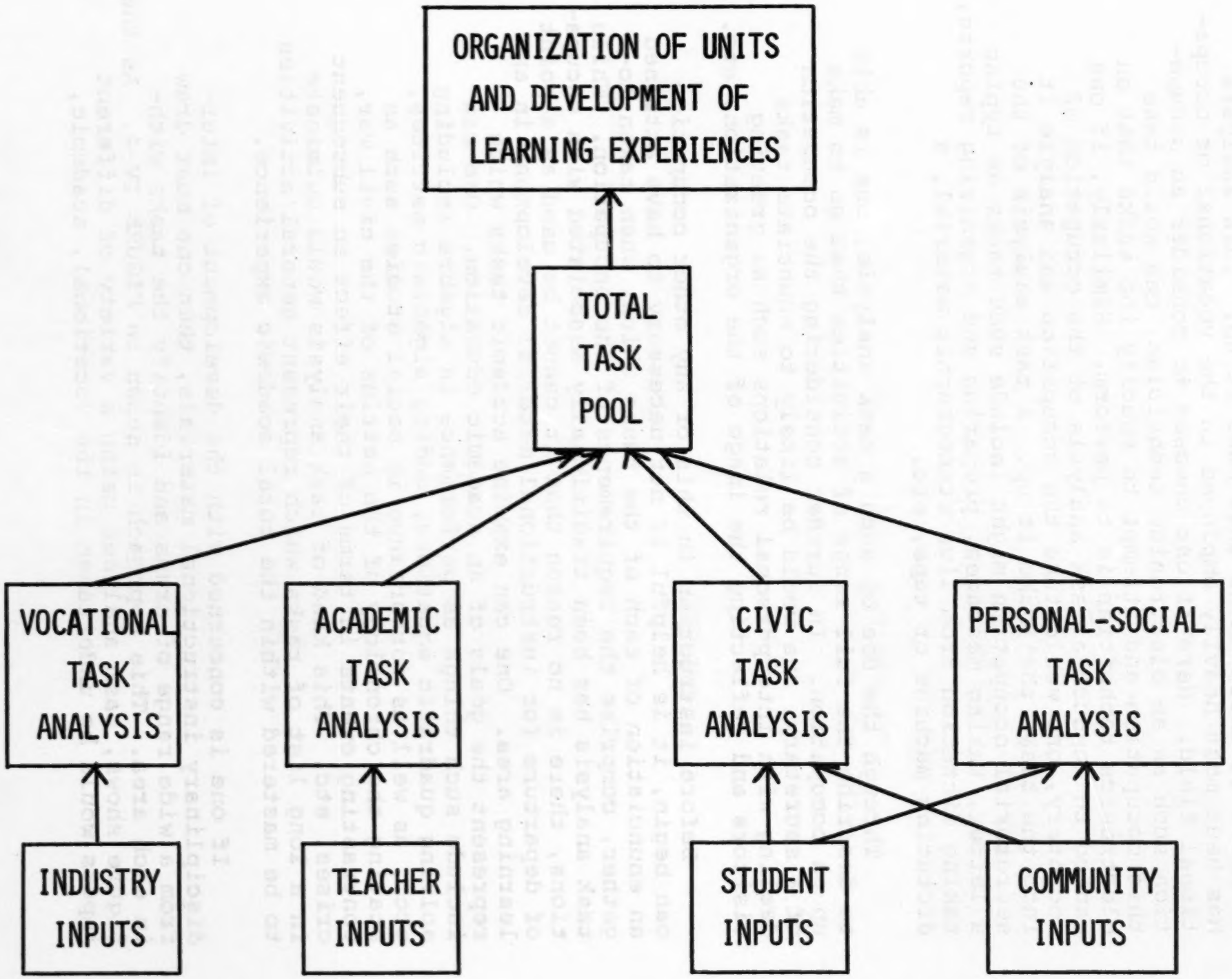
Through the use of such a task analysis, one is able to describe the full range of activities that go to make up an occupation. In further considering the occupation of a secretary, one would be likely to enunciate tasks dealing with interpersonal relations such as greeting visitors and reflecting the image of the organization, etc.

Before instruction in this or any other occupation can begin, it is helpful if not necessary to have attained an enunciation of each of the tasks which, when taken together, comprise the requirements of the occupation. While task analysis has been traditionally associated with occupations, there is no reason that it cannot be used as a point of departure for instructional material development in any learning area. One can examine academic tasks which represent the goals of an academic education. One can include such things as performance in algebra including solving quadratic equations, adding algebraic matrices, etc., as well as performance in social studies such as stating the chronology of the battles of the civil war, contrasting events in terms of their effect on subsequent crises, etc. This kind of task analysis would culminate in a long list of tasks which represent general activities to be mastered within the total academic experience.

If one is concerned with the development of interdisciplinary instructional materials, then one must draw from a wide range of areas and identify the tasks within each area. This approach is shown in **FIGURE IV-4.** As the figure shows, task analyses using a variety of different inputs would be undertaken in the vocational, academic,

FIGURE IV-4

A MODEL FOR DEVELOPING AN INTERDISCIPLINARY CURRICULUM



civic, and personal-social areas. Each analysis would culminate in the specification of tasks or performances which are required in each area of function and which have been deemed appropriate as an end point, or entry point, in moving into an area in which instruction is seen to function as a prerequisite.

Task analysis is seen as an activity which is to be undertaken and completed by experts in the fields in which tasks are being identified. Thus, if one were to attempt a task analysis of the vocation of electronic technician, then one would call upon individuals who are functioning as electronic technicians, those who are supervising electronic technicians, and those who are training electronic technicians in order to specify the tasks included in that occupation. If one were interested in providing skills in the areas of civics and citizenship, then one would call on individuals from the community representing community organizations, political organizations, and students themselves in order to generate the tasks which might be deemed appropriate in defining the range of behavior of a citizen.

The notion that one begins in the design of instruction by specifying the tasks that are to be achieved as the goal of instruction represents a departure from the typical techniques used for curriculum development. However, if instruction is seen as a route toward some goal and that goal is the performance of a wide range of tasks, then it is useful to attempt to identify those tasks in advance so that instructional sequences can be developed which are aimed specifically at the attainment of those tasks. While there are models for task analysis in the vocational areas there have not been models developed in academic, civic, or personal-social areas. Thus, the use of the task analysis approach in these areas will represent an attempt to determine how such a task analysis can best proceed.

It is also entirely possible that the specification of academic, civic, and personal-social tasks will show great generalizeability from student to student, school to school, and community to community. If such is the case, it should be possible subsequent to the specification of tasks in these areas for schools and communities and students to examine a list of tasks in each area and to specify those that are useful for its purposes. Thus, the

use of task analysis and the prespecification of tasks that define an area of interest or activity may provide a highly efficient route to allow for the individualization of goals on both the level of the student, the school, and the community. Freedom to select is difficult to implement if there is not a suitable specification of alternatives. To the extent that task analysis provides for an extensive delineation of alternative tasks to be attained, it may provide a highly useful vehicle for students, and for program developers in specifying the goals to result from a series of learning experiences. To the extent that students make the choice, they are in a position to uniquely individualize their own educational experience.

2. The Restatement of Tasks as Behavioral Objectives

Much has been written about writing and using behavioral objectives. The use of behavioral objectives has become increasingly widespread throughout the academic world. In fact, there are now organizations that collect or "bank" such behavioral objectives and catalog them, thus making them available for use in any school system desiring them. In addition, much inservice training has been afforded to teachers in the writing of behavioral objectives. However, the role of behavioral objectives in the instructional design and management process has not been clearly spelled out. The purpose of the discussion here is to better specify the place of behavioral objectives in the total sequence of instructional design.

As can be seen from the model shown in **FIGURE IV-3**, behavioral objectives represent neither the beginning nor the end, but merely a step en route from the starting point to an ending point. By arbitrarily taking the instructional activity that presently constitutes a curriculum and attempting to enunciate behavioral objectives which describe that instruction, one may be acting to improve the potential of that instruction and the evaluation of performance as a by-product of that instruction. But one is not of necessity making that instruction more relevant. In order to achieve relevance one must begin by specifying the tasks to be performed by students at the completion of instruction. This is accomplished through the use of a task analysis. Such task analyses provide statements of goals or end points that are not arbitrary to the instruction being developed, but

are rather quite meaningful and relevant in terms of students and their needs. However, in order for tasks identified through task analysis to be suitable building blocks for a systematic curriculum design, it is necessary to put them in a form where they can be used for sequencing, instructional materials design, and evaluation. It has been found that the behavioral objective is a useful rendition of the goal statement for the above purposes. Thus, the second step in the process is characterized by an attempt to take the task specified in the task analysis in the first step and to restate these tasks in the form of behavioral objectives.

A behavioral objective, as has been said many times, includes a statement of performance -- typically using an action verb, a statement of the conditions under which the performance is to occur, and a statement of the criteria against which the performance is to be evaluated.* By the systematic use of performance language as well as the specification of conditions and criteria, the behavioral objective becomes a useful device for subsequent steps in the systematic approach. However, it is again emphasized that the arbitrary selection of instructional material which is then converted to behavioral objectives is not consistent with the total philosophy of this approach.

In order for the approach recommended here to be followed, curriculum designers must begin with a specification of the tasks or goals of their instruction. This task list, so constructed, then becomes the basis for the construction of behavioral objectives. Thus behavioral objectives are not simply derived from existing instruction or snapped out of the air. They are systematically evolved from statements of tasks which are relevant to and descriptive of the goals of learning. Once behavioral objectives have been written based on these tasks it then becomes possible to move on to the third step in the process.

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*The mechanics of writing behavioral objectives have been set forth in various sources including Mager (1962) and Tuckman (1967).

3. Specification of a Sequence for Behavioral Objectives (Structural Analysis)

Structural analysis, as has been described in detail by Tuckman (1968), is a technique for specifying the sequential relationship among behavioral objectives. This process is shown in its simplest form in FIGURE IV-5. With regard to learning activity as specified by a behavioral objective as a terminal point, one can ask three questions, i.e., (1) what competencies can a learner achieve only after prior achievement of the one in question, (2) what competencies must a learner have already achieved in order to achieve the one in question, and finally, (3) what competencies are reasonably independent of, and therefore can be taught concomitantly to, the one in question.

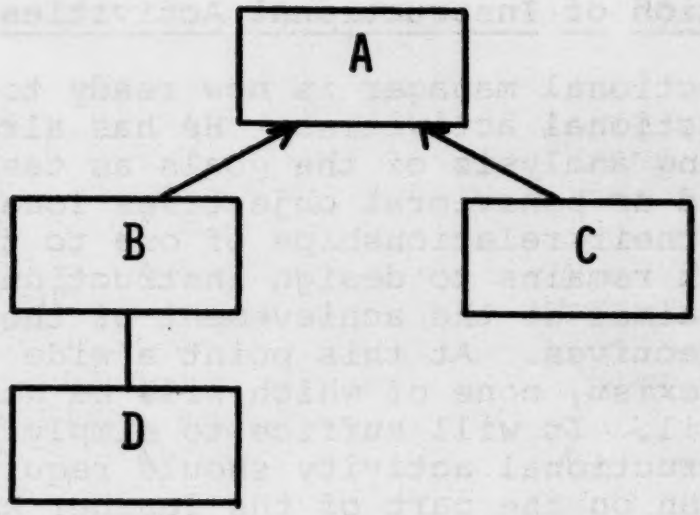
Through the use of this approach, it becomes possible to specify a sequence of instructional objectives which, when put together in the order specified, should maximize movement from entry into instruction to the attainment of some final goal.

The activity of structural analysis is predicated upon the supposition that learning is a sequential process featuring the operation of contingent relationships among the competencies, skills, and concepts to be mastered. The establishment of an appropriate sequence, moreover, is one of the essential conditions of learning. The purpose of structural analysis is to attempt to establish, on an *a priori* or hypothetical basis, the contingencies that exist between the competencies to be acquired. This analysis provides the instructional designer or manager with a map to follow in setting forth the order of instructional activities to maximize the probability that each activity will be successful. The instructional manager can then attempt to identify the prerequisites for any set of competencies, with the former serving, in turn, as prerequisites for higher order competencies. Without this approach, behavioral objectives must be sequenced on some more haphazard and less systematic basis. Ideally, therefore, one would proceed from the restatement of tasks as behavioral objectives to the specification of an order in which these behavioral objectives are to be covered within instruction, this activity being termed structural analysis.

Structural analysis is also highly useful within the

FIGURE IV-5

SPECIFYING A SEQUENCE FOR BEHAVIORAL OBJECTIVES



FOR EXAMPLE:

(1) WHAT ACTIVITIES MUST THIS ACTIVITY PRECEDE?
FOR B, IT MUST PRECEDE A.

(2) WHAT ACTIVITIES MUST PRECEDE THIS ACTIVITY?
FOR B, D MUST PRECEDE IT.

(3) WHAT ACTIVITIES CAN OCCUR CONCOMITANTLY (I.E., ARE PARALLEL)?
FOR B, C IS PARALLEL.

evaluation process because it provides, as will be described later, a model or system into which evaluative data can be fed in order to have something specific to evaluate. It provides the vehicle by which individual performance data can be used to assess and improve the instructional process. This aspect and benefit of the structure or sequence as set forth in this step will be elaborated upon later under the heading of Feedback and Iteration.

4. Specification of Instructional Activities

The instructional manager is now ready to generate and specify instructional activities. He has already produced a thorough-going analysis of the goals as tasks, as behavioral objectives, and as behavioral objectives located in a sequence with their relationships of one to the other specified. The task remains to design instructional activities which will be aimed at the achievement of these sequenced behavioral objectives. At this point a wide variety of possibilities exist, none of which will be gone into in any degree of detail. It will suffice to simply mention the fact that instructional activity should require some action or participation on the part of the learner and it should take advantage of multiple instructional alternatives utilizing the full range of media and technology available; that it should prescribe individual or small group activities where teachers represent one of many instructional resources, and that finally and perhaps more importantly, the specification of these instructional activities should be given to the students directly rather than mediated via the teacher. That is, the teacher, or manager, or designer, should develop a specification of instructional activities including setting forth textbook pages to be read, other resource books to be examined, films to be watched, audio tapes to be listened to, laboratory experiments to be carried out, shop activities to be carried out, teachers to be spoken to, classmates to be spoken to, etc., and that this series of instructional activities relevant to the achievement of an objective should be given to the student so that he can then, at his own speed and in his own way, go about carrying out the activities in order to guarantee his own competence. Needless to say, this activity must include within it the opportunity for evaluation not only of the student, but of the instructional process and the instructional materials. This leads to the next step, which should be carried out at

the same time that instructional materials and activities are being produced, i.e., designing evaluative procedures.

5. Designing Evaluative Procedures

Three types or bases for evaluation are appropriate for discussion here, although again, none of the three will be dealt with in detail. The first important function for evaluation is to evaluate the performance of each individual student as a basis for making decisions about his further progression in a particular sequence or movement on to other sequences. Individually-oriented instruction based on a systems model described herein requires reasonably constant monitoring or student performance and instructional prescriptions based on the level of this performance. In order to accomplish this, reasonably frequent evaluations must be carried out. Thus, evaluative procedures and materials must be developed in conjunction with the development of instructional activities based on the very same behavioral objectives and structural analysis that preceeded the development of instructional activities and upon which it was based.

The second function for evaluation has been called formative evaluation. Formative evaluation represents an attempt to evaluate the behavioral objectives and their sequencing in order to provide the possibility of improvement in the instructional package. Formative evaluation is an ongoing evaluation which occurs as part of the development process and allows for data to be fed back into the development process in order to improve the materials as they are being developed. Formative evaluation procedures and their relation to structural analysis and behavioral objectives has been set forth in detail in Tuckman (1967).

Finally, a third evaluative function has been called summative evaluation, and that is the overall evaluation of a final instructional package by comparing it with alternative packages. Such evaluation does not occur during the development of instructional materials but typically occurs subsequent to their development and refinement. Thus, at some point during the development process one must begin to think in terms of summative evaluation but this will more profitably occur late in the developmental process as opposed to early. The design of summative evaluation procedures has been described in considerable detail in Tuckman (1969).

Overall, the process of designing evaluative procedures entails the examination of each behavioral objective incorporated into the sequence and the development of a measurement activity to determine whether the goal as set forth behaviorally in the behavioral objective statement has been attained by the student. Thus, in designing evaluative procedures one attempts not only to measure the success or failure in performance of the terminal objective but to determine relative success and failure of each subordinate or enabling objective which exists in the structure and has been identified as a prerequisite of a terminal objective. By measuring performance on each sub-objective and the terminal objective, one is able to accomplish all three kinds of evaluation essentially at the same time.

Once behavioral objectives have been formulated and structural analysis has been completed, the task of designing evaluation procedures is simplified greatly. One need only examine the structure and for each behavioral objective in it generate a performance measure or two. Such performance measures are easily generated since one of the characteristics of behavioral objectives is that they are written in such a form, i.e., behaviorally, that they easily may be transformed into measurement instruments. Popham, in his behavioral objective bank printouts, provides not only behavioral objectives but sample measurement items as well. This is done because of the intimate relationship between such measurement items and the behavioral objectives from which they have been derived.

Thus, the task of designing evaluative procedures for either formative or summative program evaluation or for the evaluation of student progress is a reasonably simple and straightforward task using the procedures recommended in this paper.

At this point the total synthesis process has been carried on and one is ready for the stage of operations.

6. Carrying out Instructional Activities

Little need be said about this step in the process, for it is the reasonably obvious one wherein the instruction as set forth in Step 4 is now carried out. Since the sequence of instruction has already been determined and the materials

or activities which have been designed to provide the instruction have already been set forth, the process of carrying out instruction is simply to make the instructional activities available to students in the order which has been prespecified.

7. Collecting Evaluative Data

This activity within the stage of operations, occurring concomitantly to the implementation of instruction, is a reasonably straightforward one. That is, what is entailed is simply applying the evaluative procedures that have been designed in Step 5 to the actual collection of data during the course of instruction. Typically, this takes the form of automatically administering "end-of-unit" or "end-of-sequence" tests by which individual performance on terminal and enabling objectives is measured. This step may also entail measurement of attitudes and interests at various points along the way, or actual observations of behavior. However, evaluation simply follows the procedures which have been established and thus becomes an integral part of the total instructional process.

The more completely evaluative procedures have been designed and programmed into the overall instructional process, the easier, more complete, and more useful will be the process of collecting evaluative data. Most important within this data will be assessments of performance on the terminal objective and each enabling objective, making it possible to determine if a particular competency or skill has been mastered.

8. Feedback and Iteration

The step of feedback and iteration is a critical and distinctive feature of the systems model proposed herein. One of the shortcomings of most instruction as it presently occurs is that the results of the instructional process are not systematically collected nor fed back to the designers of instruction in order that these results can be used to modify instructional activities and their sequencing. That is to say, instruction as we see it today is not self-improving. This is most unfortunate because student performance, as has been suggested above, provides a basis for evaluation not only of the student and his learning

capacity, but of the instructional material and program itself. It is uncommon to see the results of student performance pooled across students used as a basis for systematic refinement of instructional activity. Yet, the sum total of students' performance reflects not only their own capacities and attention but on the nature and efficacy of the instructional program as well.

Thus, while students are evaluated by examining their individual performance, programs can be evaluated by examining data pooled across all students who have had the program. This information, however, can only be used to its greatest effect if some system for the specification of instruction is used to which this data can be related in some meaningful way. The model proposed here has incorporated this feature.

One of the critical hypotheses made in generating the instruction within this system is the sequence specification characterized by a multiplicity of hypotheses about the contingency relationships between behavioral objectives. This can be seen by referring again to FIGURE IV-5. FIGURE IV-5 reflects a number of hypotheses. The first hypothesis that it reflects is "A cannot be mastered unless mastery of B and C precede it." A second hypothesis is that "The mastery of B and C can occur simultaneously." A third hypothesis is that "Mastery of B requires mastery of D as a precursor," and finally that "Mastery of C has no identifiable precursor."

Each of these hypotheses can be tested with reference to the data which has been collected. If we have systematically measured in the preceeding step the ability of students to perform A, B, C, and D, we can then determine (for example) whether the majority of students who are able to perform B have already mastered D. We can, in fact, describe four possible outcomes that may occur when one examines the performance of B and D. (These are shown in FIGURE IV-6.) We may find, for instance, as we have hypothesized, that individuals who are performing B are also performing D and vice versa. Another possibility is that individuals may succeed in performing D but not B which is not contradictory to the hypothesis, but leads us to suspect that other pre-requisites to B may exist, or that instruction attempting to move students from B to D is insufficient. It is also possible that students may succeed on neither B nor D, a finding which is consistent with the hypothesis, but

FIGURE IV-6

POSSIBLE CONTINGENCY OUTCOMES AND THEIR IMPLICATION FOR INSTRUCTIONAL DESIGN

Outcome on superorindate*	Outcome on subordinate	Implication for hypothesis	Recommendation for design
correct (+)	correct (+)	support	no change
incorrect (-)	correct (+)	support	look for missing b.o.** improve instruction on super.
incorrect (-)	incorrect (-)	support	look for missing b.o. improve instruction on sub. & super.
correct (+)	incorrect (-)	refute	change sequence

*Superordinate might be B in Figure IV-6 while subordinate would be D.

**b.o. = behavioral objective; super = superordinate; sub. = subordinate

certainly not a happy one. It would suggest the improvement of instruction for both B and D. The fourth possibility clearly contradicts our hypothesis. That is, the possibility that students may fail on D but succeed on B provides evidence for the refutation of the hypothesis that D is a prerequisite for B. To the extent that performance data support this last possibility to a greater extent than the preceeding three, the instrument designer is encouraged to reevaluate and subsequently alter the structure which he has decided upon on an *a priori* basis. Such an alteration in terms of the example given would be to reconsider the relationship between B and D.

Many alternatives can be considered in the light of this data. If other alternatives occur frequently enough, instructional designers will be encouraged not necessarily to alter the order of the instruction, but perhaps to examine the components of the sequence to identify a behavioral objective that has been overlooked or to improve the instructional activities themselves in order to increase the likelihood that movement from lower to higher levels in the structure will be possible.

The characteristic of using performance data describing small bits of student performance and pooling this data across students to examine the structure of the instructional material as prespecified and to alter instruction in accordance with this data is an important and perhaps unique characteristic of this model (as opposed to non-systems oriented models).* Thus, the model provides for the systematic use of feedback as an aid to instructional design.

Iteration prescribes that instructional activity will be carried out again; that is the process will be reiterated or repeated. It will not be repeated, however, until evaluative data has been used to alter the total list of behavioral objectives, the sequence of these objectives, and/or the instructional activities for attaining these objectives in accordance with the evaluative data which has been fed back into the model. When this has occurred, a somewhat altered series of instructional activities sequenced

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*The reader is encouraged to examine the work of Walbesser (1969) which describes the uses of this feedback in a more systematic and detailed fashion than has been attempted here. Discussions of this point may also be found in Tuckman (1968).

in perhaps a different way than had been originally hypothesized, and featuring perhaps more, perhaps fewer behavioral objectives than originally will be made available to students. Admittedly, this repetition of instruction will occur during the next year or semester for a different group of students who will hopefully bear great similarity to those on whom the first iteration or trial is carried out. In the iteration, the second group of students will experience the instructional activities, evaluation data will be collected based on their performance, and this data in turn will be fed back into the model. The second trial, or iteration, will then provide for a second testing and refinement of the sequence as prespecified. It is expected that the structure will stand up better the second time around than it did the first. At this point it is conceivable that a third iteration can take place. Every time the instructional materials are used, it can serve as iteration or trial from which data can be obtained to use for modifying the instruction. A point will be reached when the designers will feel that the model and the design have been refined to a point beyond which no further improvements are likely. At this point, the instructional activity is ready for summative evaluation.

* * * * *

The overall purpose of this section has been to deal briefly with the elements of a systematic model for designing and managing instruction. Considerably more detail would be useful in terms of each of the activities within the model. In addition, little has been said about the manner in which data are to be stored, analyzed and retrieved for large numbers of students as would be required if such a model were to be used to design instruction for regular school systems. The reader is referred to various systems of computer-managed instruction which are used for managing, storing, retrieving, and utilizing large amounts of data as would be necessitated by the use of this approach.*

What has been attempted in this paper is to deal most saliently with the major characteristics of the model, i.e.,

*The New York Institute of Technology and the IPI Project at the University of Pittsburgh Learning R&D Center are two sources of information on CMI.

the fact that it begins with task analysis rather than with the statement of behavioral objectives, that the statement of behavioral objectives follows, and is in turn followed by a step in which these objectives are sequenced, that instructional design is ultimately followed by the operation of the program and the collection of data, and that this data is then fed back into the original design so that it can be modified on a basis of its success and/or failure. This last characteristic may be the most useful and critical feature of the model.

SCOPE'S PLANNED CONTRIBUTION (METHODS)

The contribution made by the SCOPE staff to the Willingboro project was to come primarily in three areas (see FIGURE IV-1):

1. Participation in the development of interdisciplinary behavioral objectives
2. Participation in the construction of learning packages for the various jobs in the three job clusters
3. Participation in the continuous and final evaluation of the program

The PERT-type diagram (FIGURE IV-7 with explanation in TABLE IV-1) was suggested as a guide to SCOPE's involvement.

Members of the Willingboro faculty had been exposed to developing behavioral objectives in their particular subject matter areas. They had not, however, had any experience in developing such objectives across subject matter lines. Members of the SCOPE staff were to work with the participants in a variety of ways to develop this expertise relevant to the field of human communications and its impact on society. It was hoped that this experience would lead to the development of a system by which any group of educators could be trained in the acquisition of this skill.

SCOPE personnel were to work closely with school and television people in determining the nature of the job tasks and the packaging of the necessary skills. A portion of the Willingboro staff had received some training in this area as well. It would have been our task to build upon that to which they had been exposed so as to arrive at the goal of an interdisciplinary approach.

FIGURE IV-7
PERT DIAGRAM OF ACTIVITIES FOR WILLINGBORO PROJECT

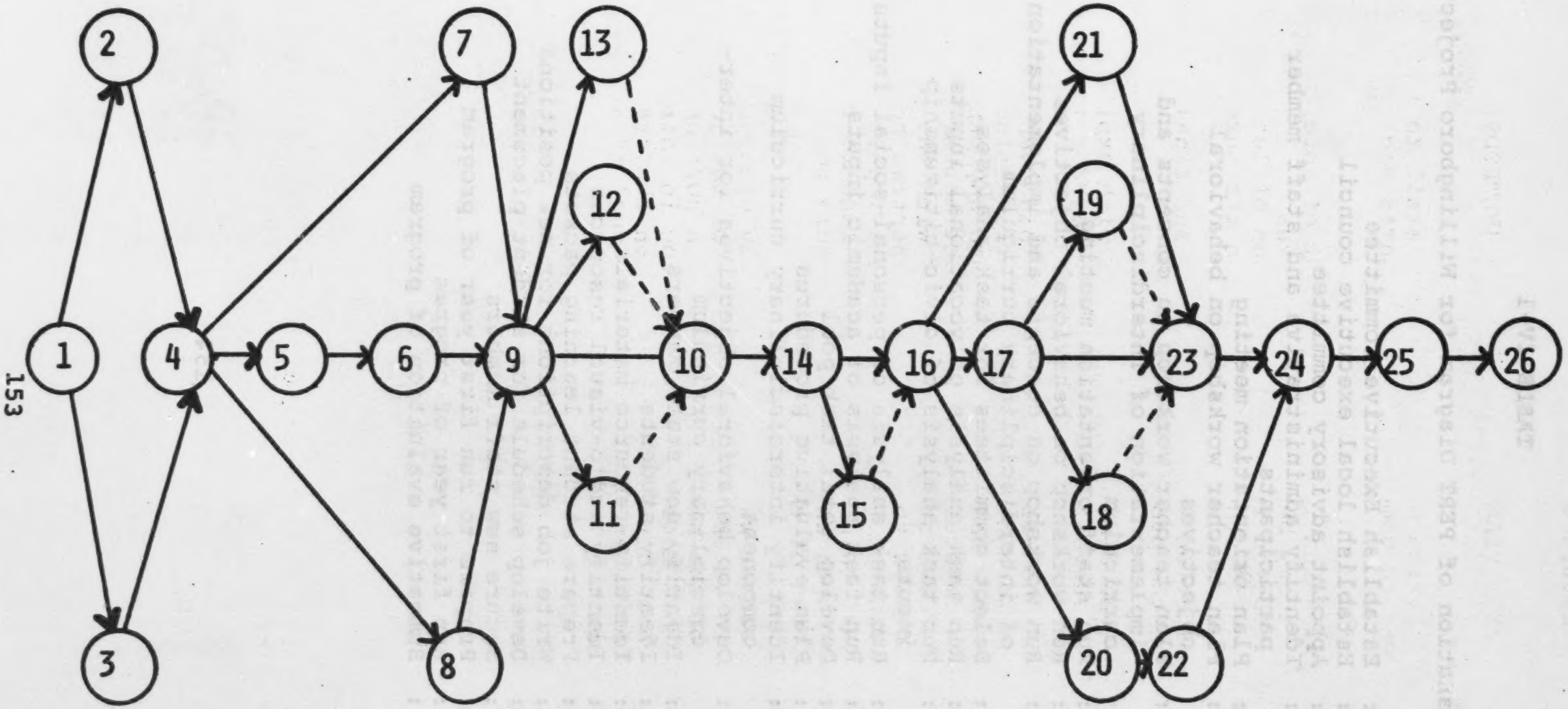

TABLE IV-1

Explanation of PERT Diagram for Willingboro Project

1-2: Establish Executive Committee
1-3: Establish local executive council
2-4: Appoint advisory committee
3-4: Identify administrative and staff member participants
4-5: Plan orientation meeting
4-7: Plan teacher workshop on behavioral objectives
4-8: Plan teacher workshop on concepts and implementation of interdisciplinary curriculum
5-6: Run staff orientation meeting
7-9: Run workshop on behavioral objectives
8-9: Run workshop on concepts and implementation of interdisciplinary curriculum
6-9: Select committees for task analyses
9-10: Run task analysis of vocational inputs
9-11: Run task analysis of civic-citizenship inputs
9-12: Run task analysis of personal-social inputs
9-13: Run task analysis of academic inputs
10-14: Develop total task pool
14-15: Plan evaluative procedures
14-16: Identify interdisciplinary curriculum component
16-17: Develop behavioral objectives for inter-disciplinary curriculum
16-20: Identify new staff members
16-21: Identify students
17-18: Identify resource materials
17-19: Identify audio-visual resources
17-23: Prepare student learning packets
20-22: Write job descriptions for new positions
21-23: Develop schedule for student placement
22-23: Secure new staff members
23-24: Prepare to run first year of program
24-25: Run first year of program
25-26: Summative evaluation of program

A most important function for SCOPE was to have been to assist in the design and implementation of evaluation procedures for each phase of the program. For purposes of evaluation, the Willingboro project was to have been divided into three overlapping phases covering a total of four years (see FIGURE IV-2).

Phase I: 1969-70, 1970-71

Phase II: 1970-71, 1971-72

Phase III: 1971-72, 1972-73

The evaluation study would have begun basically during Phase II, when procedures and instruments would have been developed for a formative evaluation of both the behavioral objectives and instructional materials produced during the project's first year. This, in essence, would have been an evaluation of the program as it had run to that moment.

The first year of the final phase, 1971-72, would have required the collection of evaluative data on the first two years of the program and then introduced any necessary changes determined by the formative evaluation. The final, or fourth year, would have involved designing the final program and the summative evaluation procedures to accompany this design, running the program while simultaneously collecting data, and finally making final program decisions as determined by a study of the evaluative data. The summer periods would have been used for extensive redesigning in preparation for the forthcoming year (see FIGURE IV-2).

An Executive Committee was established and was charged with the responsibility for overall management of the project. The committee members are: Mr. Thomas Dietz, Willingboro; Mr. Richard Smith, Willingboro; Mr. George Brandeau, Willingboro; Dr. Bruce W. Tuckman, Rutgers University; and Mr. Joseph H. Casello, Rutgers University.

Subsequent meetings of this committee led to the formulation of basic goals for the project. They were:

1. Students who complete a course in Communication Arts and Technologies will demonstrate, through performance, relevant skills for job entry into the television industry.

2. Students who complete a course in Communication Arts and

Technologies will demonstrate, through attitude and motivation, the affective attributes necessary for successful employment in the television industry.

3. The administration and staff involved in this project will demonstrate, through performance, the ability to generate behavioral objectives and instructional materials which are interdisciplinary in design.

4. Participants in this project will generate a concrete model (vehicle) which integrates civic - citizenship, personal - social, academic, and vocational skills.

RESULTS

The major problem concerning the Willingboro Project was the fact that the state funding necessary to begin the work was not available. This, in turn, led to a reluctance on the part of the administration and staff at Willingboro to commit time and resources to something that was not a reality.

The application for vocational-technical education programs funds was originally submitted under the title: Vocational-Technical Education in Television. This proposal was to be funded by monies provided by the Vocational Education Amendments of 1968 (Public Law 90-576). Subsequently, a preliminary proposal application was filed with the State Office of Program Development concerning a project to advance creativity in education. This proposal was filed pursuant to the Elementary and Secondary Education Act - Title III of Public Law 89-10 as amended, and entitled: Creating a Responsive Curriculum. On March 10, 1970, a letter was sent from the State Office of Program Development indicating that they had received one hundred and sixteen (116) Title III preliminary proposals. In view of this data and the limited amount of federal dollars available, it was necessary to reject over 70% of the applicants, Willingboro included. Because Willingboro has not been able to obtain the funds necessary to support teacher time as applied to the intended joint effort, it was necessary to restrict our intended activities.with Willingboro. Thus, the CAT Project as conceived for Willingboro really never began. However, since a person had already been hired by SCOPE, he was assigned to Willingboro and participated in the following:

1. the refinement of the plan for a short-term interdisciplinary program in Communication Arts and Technologies.

2. development of course title articulation in the areas of Industrial Arts, Home Economics, and Business Education.

3. identifying programs for students with special needs.

4. improving the vocational posture of the school system.

5. vocational curriculum development.

6. an on-going curriculum development in-service program.

We may conclude that the systems model advocated here as a short-term strategy for the development of an interdisciplinary curriculum is a sound one, and, given money and talent, could be successfully and efficiently implemented in a comprehensive high school. It is difficult to draw conclusions from the Willingboro Project for the Plan for ES '70. One might argue that our failure to launch the Willingboro Project is good evidence that the Plan for ES '70 would not work. However, it must be noted that SCOPE and Willingboro showed full evidence of being able to work together. We engaged in interactive planning and design. Had we not intersected with a severe cutback in Federal funds (as apportioned to the states), then the Willingboro Project would probably be functioning today. Therefore, the case on the Plan cannot be closed. We cannot conclude that it works or does not work. We can conclude that it might work given adequate funding.

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Part V The Student-Centered Curriculum: A Concept in Curriculum Innovation

The purpose of this paper is to describe a concept known as the student-centered curriculum. This curriculum concept is an emerging one, and this paper must be considered a working paper or draft of developing ideas all of which are subject to continual refinement and revision. The student-centered curriculum concept will be described in terms of a series of postulates which provide a basic definition of what the student-centered curriculum is to be. From these postulates propositions are then derived which describe the way the student-centered curriculum must be constructed and how it must operate. No attempt will be made to cite large amounts of literature in support of the postulates that are made. Some of the postulates can be supported empirically. Others of the postulates represent some very basic assumptions about the nature of curriculum.

Postulates

Postulate #1. A curriculum must be defined in terms of its goals as they apply to students.

A curriculum must have a purpose. Its purpose ostensibly is to provide students with experiences that will lead them to attain certain desired end states. Pre-specification of these end states provides a guide for the direction of the instructional process as well as a basis for determining if the instructional process has been a success. Thus, a curriculum must be defined in terms of the educational goals of students. This is synonymous with saying that it must be defined in terms of the educational needs of students, for the goal of the curriculum is to meet the educational needs of the students.

It is considered reasonable to further assume that educational goals may be broken down into three broad areas, i.e., (a) occupational, (b) civic - citizenship, and (c) personal -

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* This paper originally appeared as SCOPE Incidental Report # 2. A shortened version of it appears in Educational Technology, 1969, 9, 26-29.

social. In the occupational area, the concern is with the skills and competencies that will be required to obtain and maintain meaningful employment throughout one's life. Since one functions as part of a societal system, civic and citizenship behaviors are also seen as necessary and thus providing for them becomes a goal of education. Finally, an individual must develop a self-concept which is adequate for him, must have sufficient ego development in order to function, and must be able to relate to individuals on a personal and interpersonal basis. To this end, personal and social skill development would seem to be appropriate as a goal of the curriculum.

Of maximum importance is the point that desired goals or end states are here posited as part of the basis for defining the curriculum.

Postulate #2. Occupational goals are, for a large majority of students, those requiring less than a bachelor's degree.

This statement is more than a postulate. It is, in fact, a fact. At the present moment, approximately 20% of our young people in the United States obtain a bachelor's degree. The remaining 80% fall into one of the following categories: high school dropout, terminal high school graduate, two-year college dropout, two-year college terminal graduate, or four-year college dropout. Thus, for this large proportion of youth, approximately 80%, their ultimate goals in the occupational area must focus on occupations which require less than a bachelor's degree for entry.

Postulate #3. A curriculum must be defined in terms of the psychological structure (i.e., learning style), and educational experiences (i.e., what has already been learned) of students.

Since the curriculum is intended to serve as a means by which students learn, it is necessary that the curriculum be defined and developed in such a way that the psychological structure of students is considered. That is to say, the curriculum must be structured in such a way as to be consistent with and meaningful in terms of the way that people learn. We often talk about learning style as a way of describing broad individual differences in the way people learn. For a curriculum to provide learning opportunities, it must be developed in a way which is consistent with the learner's learning style.

Secondly, learners do not come to any particular learning situation without having had prior experiences. In defining a curriculum which centers on students, it is necessary to consider the relevant prior learning experiences that students have had as they relate to the curriculum at every point. To this end, one must be sensitive to the issue of transfer of training.

Thus, the student-centered curriculum is partially defined in terms of the educational needs of students (Postulate #1) and partially defined in terms of the prior experiences and learning styles of students.

Postulate #4. In terms of learning style, learning of the concrete must precede learning of the abstract.

Jean Piaget, the eminent European developmental psychologist, has in the course of a 40 year career shown that children learn concrete operations before they learn abstract operations and that, moreover, abstract operations cannot be learned unless concrete operations are learned first. Thus, the concrete learning style and materials which appeal to it must precede that of the abstract. Before the student can be expected to master some of the representational intricacies of subjects like algebra, he must in terms of Piaget's work first have mastered some very concrete principles such as those dealing with conservation of area and volume.

In general, younger children function more successfully in the concrete realm than in the abstract, with tendencies toward the abstract increasing with age. However, as a function of the experiences that a young person has had, it is entirely likely that he may develop into and through adolescence without ever completely reaching the stage of abstract operations. The extent to which development occurs beyond the concrete into the abstract is a function of the learning experiences that the youngster has already had.

Postulate #5. Learning can be maximized by controlling the sequence towards some goal and locating the student in that sequence.

This postulate contends that learning is an experience which requires that the conditions under which it is likely to

occur be controlled. The contention is that learning is not a haphazard occurrence; rather it is an occurrence which occurs reliably and predictably under certain conditions, with different kinds of learning and learning by different kinds of people, occurring under different conditions. To the extent that one can associate the conditions of learning with those that are relevant for a specific person, one should be able to produce learning. This position has been well documented by Dr. Robert M. Gagne, in his book The Conditions of Learning.

From this position, one can argue that learning experiences can be sequenced in such a way as to maximize the likelihood that students will be able to go through them en route to some predictable goal. Thus, after one has predetermined the goal, one can determine the learning experiences and the sequence in which they are to occur in order to increase the likelihood that students will achieve the pre-specified goal. Once this has been done, the experiences in that sequence that the student has already had can be determined, and the student can be placed at a point in the sequence where he can begin having those additional experiences which will lead him to the goal.

Thus, one attempts to manipulate the conditions of learning in such a way to maximize the likelihood that learning will occur. This is a prescription for the imposition of structure on the learning process, since the learning process appears to be one which is a highly structured one. As the kind of learning varies and the learner varies, the structural requirements of the situation may very well vary. Nevertheless, one should be able to determine by some sort of analytic process what the ideal conditions for learning are, and establish them in an optimal sequence. Individual differences will influence whether the student is given the sequence at all, if so, where he begins it, and how rapidly he progresses through it.

Postulate #6. Learning can be made efficient by combining sequences that are psychologically similar.

Any curriculum is going to include a multiplicity of goals. Following Postulate #5, any curriculum will also include a multiplicity of sequences. One can further structure the curriculum by grouping these sequences in some manner. Postulate #6 contends that the most efficient way to group them is in a way which takes into account the psychological characteristics of human beings. If one can identify a model which identifies the

qualities of human behavior and human functioning across all domains of human activity, it is likely that such a model can be used to efficiently combine learning sequences.

Postulate #7. Learning is most meaningful when a person learns through interaction with his environment.

Work such as that of Harvey, Hunt, and Schroder, and Anderson and Moore, provides strong evidence for the fact that interdependent conditions for learning are the most efficacious. In the interdependent learning model the individual learns through interaction with his environment. This is in contradistinction to a unilateral model where some agent establishes external criteria and affects the behavior of individuals in terms of these criteria through the use of rewards and punishments. In the interdependent model any rewards and punishments forthcoming would be a product of the interaction between the learner and the environment and would be intrinsic rather than extrinsic. Learning on this basis, however, requires that the environment be of such a nature as to result in the learning which is desired. The environment must be structured or "programmed" to maximize the occurrence of the desired outcomes.

Propositions

Proposition #1. The curriculum must be vocationalized in order to: (a) meet a student's future employment needs, and (b) provide a concrete context for learning.

Since as many as 80% of today's young people will enter the work force with educational experiences at less than the bachelor's level, it is necessary that instructional activity be provided to help students master the skills and competencies that they will need for entry into the occupational world. To some extent, these experiences will be provided through industrial training programs, but to a large extent, responsibility for this will fall to the schools. Thus, the curriculum centered on student's needs must have a liberal sprinkling of educational experiences specifically relevant to the occupational needs of the large majority of youth. These experiences may revolve around a cluster concept of vocational education in order to provide students with the broadest possible experience.

A second reason for vocationalizing the curriculum is in order to take advantage of the postulate that concrete learning must precede abstract learning. The vocational context is a highly concrete one, within which previously considered abstract concepts may be more easily mastered by students, particularly those students whose experiences heretofore have not provided a great opportunity for the mastery of concrete concepts. Individuals from somewhat disadvantaged backgrounds in particular will, by virtue of their biological need state and limited prior experience, be much more likely to learn in a concrete context even during their adolescent years than an abstract one. Thus, the vocational milieu is a way to make all education relevant in the sense of giving it the kind of referent that is meaningful to the learner. Teaching physics principles in an electronics laboratory or mathematic principles in a business course is a way to provide hitherto abstract notions with a highly concrete context, thus increasing the likelihood that mastery will occur.

Proposition #2. Behavioral objective identification must precede curriculum development in order to identify goals and facilitate evaluation.

If the curriculum is to proceed from a delineation of goals, then the identification of goals must be the first step in the curriculum development process. Moreover, these goals must be identified and specified in behavioral terms in order to give them meaning to all who must follow in the process and contribute to the development of the curriculum. The place to begin is with goals, and behavioral objectives are a form of goal statement with enough specificity to make them usable by curriculum developers and evaluators alike.

Proposition #3. Behavioral objectives must be sequentially analyzed to provide sequences of learning experiences.

The behavioral objective is a good place to begin the process of identifying sequences of experience that will ultimately constitute the curriculum. Such sequences of experience are meaningful only in terms of what they add up to, that is, where they end up. In order to guarantee that such sequences end up where you want them to end up, one begins at the end point and works backwards. In another paper dealing with the concept of structural analysis, I have described in detail the process by which one

analyzes behavioral objectives into sequences of skills and competencies. Having done this, one increases the likelihood that by placing a student into such a sequence, the goal objectives from which the sequences have been analyzed will be reached.

Proposition #4. A model for combining sequences and thus students in sequences must be developed which is consistent with the psychology of human function and the three classes of goals.

A curriculum cannot consist of an infinite or near infinite series of disconnected sequences. Each sequence can take on additional meaning by being grouped and connected to other sequences which relate to it not only in terms of the goal object, but in terms of the nature of skill or competency or knowledge which the sequence is an attempt to facilitate. The practical requirements of a learning situation necessitate some form of packaging of the sequences. The form the packaging has taken thus far in our educational history has been by subject-matter. However, subject-matter is not inherent to the learning experiences nor to the learner. Perhaps it would be more meaningful to use some characteristics which are inherent in both the subject-matter and the students who are to learn them as a basis of clustering learning experiences. Characteristics which are descriptive of human function and equally consistent with the three classes of goals, i.e., occupational, civic - citizenhip, personal - social, should be maximally effective, since the curriculum is to be defined in terms of both of these kinds of characteristics.

We are presently engaged in building and validating a domain-process-object model which will serve to cluster and combine learning objectives and thus sequences of learning experiences (see Part I).

Proposition #5. "Individualized" instruction can be approximated in groups, but these groups will be shifting rapidly in membership over time.

Individuals will be simultaneously instructed when they are at the same point in the same sequence. This proposition argues against individualized instruction in the sense which we have come to think of it, namely, students working by them-

selves with relatively impersonal presentation devices or books, often linked to a computer to provide them, with again, equally impersonal feedback. Many have argued against individualized instruction and opted for a major role for the teacher who can provide the "human element." If a curriculum were to be built around learning sequences, there is no necessary reason why each student should go through a sequence in isolation from all other students. Not only would isolation eliminate the opportunity for important social interaction, which is a desirable experience in its own right, but it would also reduce the efficiency with which learning sequences can be used in educational programming. At any point in time, it is entirely likely that within the large secondary school a number of students greater than one will be at roughly similar points in some of the same learning sequences. In other learning sequences, they may be at different points, but in some sequences they may be in the same point. Thus, it is possible to present learning experiences to a group of students in order that all students may move through a particular learning experience toward a particular goal.

However, these students will not constitute a group in the static and rigidified manner in which that term is presently used within the educational establishment. While they may exist as a group for a particular learning experience or sequence of experiences, for the following learning experience they may each find themselves as parts of other groups. Each individual will be individualized at the same time that each other individual is individualized. However, taking advantage of enrollment and the generalized nature of the sequence, it should be possible to find more than one student ready for any particular experience at any point in time.

A computer will be useful for scheduling this kind of curriculum in that it requires the ultimate in modular scheduling. This curriculum would also necessitate the creation of an ungraded school, since gradedness is not necessarily consistent with the sequences and learning experience that will be contained in the curriculum.

Proposition #6. Learning must be propagated through learning experiences, i.e., "hands on" experiences, rather than lecturing by the teacher.

Materials must be prepared to allow students to learn through

their environment. The environment must be structured to maximize the probability that the desired learning will take place. Based on the postulate that learning is maximized when one interacts with one's environment, it follows that in order to maximize learning, one would want to structure the environment in such a way that the probability of learning particular concepts or particular skills and competencies from interaction with a particular environment will be maximized. To this end, one concentrates not on writing lesson plans, but on writing experiential units, i.e., participation exercises which provide a vehicle for learning experiences to occur.

One thinks of experiences in conjunction with particular participations which in turn produce desired and pre-specified learning. The learner nedd not be told what the purposes of the participation are in the eyes of the developer, but given a skillfull participatory exercise and a teacher who has been skillfully trained and instructed in maximizing the value of that exercise, it is often possible to very closely approach attainment of pre-specified goals.

* * *

The student-centered curriculum will be ultimately built on the basis of the postulates and propositions described above. It will be a goal-oriented curriculum in that it will begin by a specification of goals broken down into the three goal areas identified. It will reflect the progression from concrete to abstract, using the vocationalizing experience as a context for concrete learning as well as a way of providing young people with occupationally-relevant experiences. It will be made up of a series of sequences which are analyzed from specified goals. These sequences will then be combined in terms of a psychological model which is in the process of being constructed.

Once the goals and the sequences are identified and combined according to the model which is being developed, the next step undertaken will be to develop specific learning materials to achieve the goals that have been set forth. These materials will primarily be of a participatory nature, where the teacher's role will be to guide the participation so that desired end points may be reached.

At the same time that the curriculum is being constructed, it will be valuable for individuals to examine the physical and administrative structure of the educational system as we now know it. Any curriculum which is built based on the propositions and postulates described in this paper, that is, any truly student-

centered curriculum, will require an administrative structure and perhaps a physical one which differs in many respects from that presently in existence in the majority of school districts in the United States. The student-centered curriculum would appear of necessity to require a non-graded school. It would do away with the traditional concept of ability grouping and tracking as it is presently practiced in most American secondary schools. It would require modular scheduling of the finest degree and it would require a computer system for record keeping and sequence coordination. Teachers would have to be trained to function out of a framework other than the traditional subject-matter framework, and to play a role in the classroom which is different from the instructional role the teacher presently plays. Rather than being the provider of information, the teacher will function within a student-centered curriculum as a guide and interactor providing additional instruction or direction as needed in conjunction with the discovery processes which are implicit in participation as a basis for learning.

A student-centered curriculum will make great use of multiple instructional strategies, allowing students to learn through interaction with their environment, utilizing all sensory modalities. Visual aids, as well as participation aids of all sorts will be utilized, and multiple means of instruction will be built into the same sequence for the same students at the same time. Thus, a technology will have to be adapted to the purposes of facilitating the use of this kind of curriculum.

Additional demands different from those presently in existence will be placed upon the guidance systems of the schools, whose guidance activities will have to be closely coordinated with the student-centered curriculum. Guidance will no longer have the simple option of placing students in tracks and thus considering their development process in good hands. Guidance will be continually needed as students proceed through a student-centered curriculum in order to help students to maximize themselves in terms of the choice process. At many steps along the way students will have to make choices between different sequences of activities. These choices will be aided by the use of a guidance system utilizing tests and interviews. However, the purpose of these tests and interviews will have to be to maximize the students' opportunities to learn and succeed in a student-centered curriculum rather than to try to predict the degree to which the student can succeed -- thus creating a self- and teacher-expectation, and irrevocably locking the student into a particular curriculum or program of study.

In conclusion, the advent of a student-centered curriculum, should it ever come to pass, would require some basic changes in the instructional system. Before one were to do something as dramatic as this, one would want to have great confidence in the postulates and propositions about which a curriculum is based, primarily by giving such a curriculum adequate tests on an experimental basis. At this point in time, it is necessary to discuss and consider what a student-centered curriculum is, what assumptions it makes, how it would be constructed, and how it would be implemented.

In thinking through these questions, it is necessary to challenge many of the existing practices in the schools today. This challenge is carried out not as a way of catharting the writer's existing hostility, should any exist, but is an exercise in working through and thinking through ideas which may have some possible merit. It is hoped that the reader will react to the challenges that are presented not in a negative sense, but in terms of the spirit in which they are presented.

As Dr. James Evans concluded in a speech to the American Educational Research Association, and I quote, "We know how to produce astronauts. Let's see if we can produce 'astrotots'."

EPILOGUE

SCOPE was a program aimed at curriculum innovation in the secondary schools. Its task was both theoretical and practical; theoretical in the sense of model building and practical in the sense of working with the vocational curriculum lab directors. It is hard to know how much influence a project has had. We have written many reports on many sheets of paper and sent them to many people. We have attended many meetings and spoken about SCOPE to many colleagues (ES '70, AERA, AVA, APA). Our models have been fairly widely publicized.

However, we had hoped to do more than just build models. We had hoped, through the Willingboro Project, to engage in the activity of curriculum development and witness and study the use of the curriculum we had helped develop. We never got the chance because of a tightening of funds, making it impossible for Willingboro to finance its part of the project. All that is now history.

The SCOPE era has witnessed a growth in the use of behavioral objectives, an increased interest in the systems approach, and the coming of age of individualized instruction. The laggard throughout this period of educational advancement has been the introduction of the interdisciplinary approach. We, the educational community, hold firmly to our lines of territoriality — the subject matters. We use them to help establish our professional identity. But subject-matter is not isomorphic with behavior nor with life. We use the subject matters to engage in processes — problem-solving, communicating, reacting, etc. Why not orient the curriculum around processes? To this end, we offer our taxonomy and some limited data to support it. The next step would be to use the taxonomy for classifying educational objectives (see the PROLOGUE) and seeing what groupings of objectives result. We did not get that far, but we do welcome anyone using our taxonomy and trying to take it this next step.

The territoriality "problem" (perhaps it would be wiser to call it a phenomenon or epiphenomenon) also affects curriculum development in terms of its locus of activity, i.e., who will develop what curriculum where. The national-local controversy rages on through all facets of education. Local activities are more customized, more responsive, and usually more readily adopted. National activities can draw upon a wider range of talent and usually avoid duplications of effort. Practicality

has primacy at the local level while theory often prevails nationally. SCOPE touched this issue at two points. Helping the vocational curriculum lab directors — state functionaries — operate out of a national frame of reference was a major part of our activity. At no time did we opt for curriculum development to be a national activity. We moved toward an amalgamation of national and local, of theoretical and practical. By creating a national organization for purposes of communication and exchange, the lab directors provided themselves with a vehicle for combining local initiative with national scope. We helped.

The ES '70 network represented an attempt to use a national organization to combine the strengths of local systems and give them visibility. SCOPE, a national and largely theoretical project, opted to merge its strengths with those of local schools in a Plan for ES '70 (see Part IV). The plan was never realized but it stands as a model for the fusion of university and public school interests, an amalgam of national and local, theoretical and practical.

Were there to be another SCOPE, it should correspond closely in design to the Willingboro Project described in Part IV of this report. The Federal government should let the original contract for the development and testing of a student-centered curriculum to a school system or network of school systems. A "center" such as SCOPE should then be subcontracted to perform certain tasks. Industry might also be called upon to do part of the job. Together a curriculum could be quickly and efficiently constructed. It would conform closely to local needs but be based on principles affording much generalization. Provision for tryout would be automatic and evaluation and revision would be built-in. Other school systems could then look at the specifications and evaluation of the curriculum and plan for its best for them. School systems are much likelier to use concrete curriculums than models and philosophies although the former have little meaning without the latter. The combination of university and public school would provide for both theoretical and practical elements — the model and its implementation.

Our model is described in Part I of this report. We look forward to seeing it applied to curriculum development, task analysis, and competency test development. Our philosophies appear in Parts IV and V. We look forward to seeing them considered, discussed, reacted to, and hopefully implemented.

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800 ABSTRACT
801 SCOPE activity was divided up into the following: (a) the development and testing
802 of a taxonomy for classifying educationally-relevant behaviors, (b) forging an
803 effective communication link among State-supported curriculum laboratories in vo-
804 cational education, (c) a study of ability-grouping, (d) developing a systems model
805 (short-term) for achieving interdisciplinary education (the Willingboro project in
806 communication arts and technologies), and (e) developing the student-centered cur-
807 riculum: a concept in curriculum innovation. Each activity is covered in a section
808 of the final report. ** The taxonomy as developed included 4 domains (perceptual,
809 cognitive, affective, psychomotor) by 4 processes (acquisition, application, eval-
810 uation, communication) by 3 objects (data, people, things). Testing the model was
811 done by administering aptitude tests, competency tests, and competency ratings to
812 38 secretarial trainees and 36 technician trainees. Factor analyses and correla-
813 tion analyses provided some support for the 4 domains. ** Directors of 15 voca-
814 tional curriculum laboratories participated in two SCOPE conferences. As a result
815 of the first, the Vocational Instructional Materials (VIM) group was founded and
816 affiliated with the AVA. The second conference resulted in a "recent innovations"
817 publication. ** 18 grouping studies were reviewed. Data were collected which sug-
818 gest that grouping results in lockstep patterns. ** A conjoint project with the
819 Willingboro public schools was designed. Its purpose was to build an interdisci-
820 plinary curriculum using the systems approach. It never got beyond the planning
821 stage because of a shortage of local funds. ** The student-centered curriculum
822 advocates individualized, interdisciplinary, occupationally-relevant education.

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